LEVEL II

AD A118361

INSTALLATION RESTORATION PROGRAM RECORDS SEARCH

For Langley Air Force Base, Virginia

DTIC
ELECTE
AUG 17 1982
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CH2M HILL

Supersedes AD-A106864

Prepared for

AIR FORCE ENGINEERING AND SERVICES CENTER
DIRECTORATE OF ENVIRONMENTAL PLANNING
TYNDALL AIR FORCE BASE, FLORIDA 32403

JUNE 1982

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS TACTICAL AIR COMMAND
LANGLEY AIR FORCE BASE, VA 23665

30 JUL 1982

REPLY TO ATTN OF: DEEV

SUBJECT: Installation Restoration Program (IRP) Records Search, Langley AFB

TO: See Distribution

1. We provided your office with copies of the subject report on or about 31 Oct 81. This study used a site rating model developed in Jun 1981 to identify the potential for contamination resulting from past disposal practices. On 26-27 Jan 82, representatives of USAF OEHL, AFESC, several major commands, Engineering Science, and CH2M Hill met at our office to develop an improved rating system. The new rating model, Hazardous Assesment Rating Methodology (HARM), is now used for all Air Force IRP studies. To maintain consistency, AFESC had their on-call contractors review their phase I studies performed before the advent of HARM and provide two additional appendices. The new appendices address the background of the HARM system and evaluate each of the phase I sites using the Jan 82 rating methodology.

2. Enclosed are copies of the added appendices for the Installation Restoration Program (IRP) Records Search at Langley AFB. Request you attach these appendices to the phase I reports we provided you in Oct 81.

3. For AFRCE-ER: Request you distribute copies of the new appendices to the Regional Environmental Protection Agency and Virginia State Department of Health, Division of Solid and Hazardous Waste Management.

4. For DTIC: Request you integrate the enclosed appendices with the Installation Restoration Program Records Search for Langley AFB into the National Technical Information System (NTIS). The report and new appendices are approved for public release with unlimited distribution.

5. Our project officer for IRP is Mr. Burnet, A/V 432-4430.

FOR THE COMMANDER

George C. Windrow

GEORGE C. WINDROW
Actg Dir of Eng & Env Plng

1 Atch
Appendices

Readiness is our Profession

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(6)

INSTALLATION RESTORATION
PROGRAM RECORDS SEARCH

For

LANGLEY AIR FORCE BASE, VIRGINIA

Prepared for

AIR FORCE ENGINEERING AND SERVICES CENTER
DIRECTORATE OF ENVIRONMENTAL PLANNING
TYNDALL AIR FORCE BASE, FLORIDA 32403

By

CH2M HILL
Gainesville, Florida

(12)

(11)

June 1982

Contract No. F08637-80-G0010 0001

(15)

412093

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FOREWORD

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References--Includes a consolidated list of references (reference numbers are denoted in the text by brackets [ ])

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LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS USED IN THE TEXT

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS USED IN THE TEXT

ac	acre(s)
AGE	Aircraft Ground Equipment
AFB	Air Force Base
AFESC	Air Force Engineering and Services Center
bls	below land surface
CE	Civil Engineering
cm	centimeter
col	colonies
DO	dissolved oxygen
DOD	Department of Defense
EHS	Environmental Health Services
EOD	explosive ordnance disposal
EPA	Environmental Protection Agency
°F	degrees Fahrenheit
ft	foot (feet)
GATR	Ground Air Transmitter Receiver Site
gpm	gallon(s) per minute
HAN	Heavy Aromatic Naptha
HTA	heavier-than-air
HRSD	Hampton Roads Sanitation District
HRWQA	Hampton Roads Water Quality Agency
LTA	lighter-than-air
mg/l	milligram(s) per liter
ml	milliliter(s)
msl	mean sea level
NASA	National Aeronautics and Space Administration
NPDES	National Pollutant Discharge Elimination System
N.W.	northwest
PCBs	polychlorinated biphenyls
POL	petroleum, oil, and lubricants
ppm	parts per million
ppt	parts per thousand
sec.	second

sq. ft.	square foot (feet)
SU	standard pH units
S.W.	southwest
TAC	Tactical Air Command
ULV	ultra low volume
UXO	unexploded ordnance
VA	Veterans Administration
>	greater than
<	less than

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

A. Introduction

1. CH2M HILL was retained by the Air Force Engineering and Services Center (AFESC) on January 26, 1981 to conduct the Langley AFB Records Search under Contract No. F08637 80 G0010 0001.

2. The identification of hazardous waste disposal sites at military installations was directed by Defense Environmental Quality Policy Memorandum 80-6 dated June 1980, and implemented by Air Force message dated December 2, 1980, as a positive action to ensure compliance of military installations with the Resource Conservation and Recovery Act (RCRA) and implementing regulations. The Records Search comprises Phase I of the Department of Defense Installation Restoration Program. The main purpose of the Records Search Program is to determine the potential, if any, for migration of toxic and hazardous materials off the installation boundaries.

3. The Langley AFB Records Search Program included a detailed review of pertinent installation records, contacts with various government and private agencies for documents relevant to the Records Search effort, and an onsite base visit conducted by CH2M HILL during the week of March 23 through March 27, 1981. Activities conducted during the onsite base visit included interviews with past and present key base employees, ground tours of base facilities, and a helicopter overflight to identify past disposal areas.

4. In the event that the Records Search indicates that the potential exists for migration of hazardous contaminants off the installation, Phase II field work would be conducted to confirm the presence of the specific migrating contaminants and to determine the extent of migration. The restoration or containment of the hazardous waste disposal sites would comprise Phase III of the Installation Restoration Program.

B. Major Findings

1. Interviews with past and present key base employees resulted in the identification of 11 past landfill sites and the approximate dates that these sites were in operation (Figure 1). The types of materials that were sent to landfills for disposal in the past include empty pesticide and herbicide containers, old paints and thinners, metal scraps, fly ash from coal burning, some waste oils and solvents in drums, paint chips from sandblasting operations, construction demolition debris, putrescible garbage, and a small amount of mercury-contaminated sand that was treated by chemical fixation prior to disposal. Some limited data is available from surveillance and analysis work performed at some of the landfill sites. No significant concentrations of hazardous materials were found in any of the water and sediment samples analyzed.

2. Interviews with past and present key base employees resulted in the identification of 13 possible contaminated sites other than landfills. These sites include four possible fuel-saturated areas, three old wastewater treatment plant sites, a past disposal area for old gas cyclinders from the lighter-than-air (LTA) area, an old chemical leach pit used for pesticide washdown, a past outside storage area for polychlorinated biphenyl- (PCB-) containing transformers, an outside storage area for pesticides and herbicides, an old coal storage area, and the existing waste oil storage area.

C. Conclusions

1. The Langley AFB Records Search did not reveal any specific documentation of past hazardous waste disposal at the installation or migration of contaminants off the installation. However, the potential does exist for contaminant migration due to the following factors:

a. The age of the installation and the large number of past disposal sites (11) at the installation,

b. The lack of adequate records concerning the types of materials disposed of at the installation ;

c. The high ground-water table conditions at the installation

d. The environmentally sensitive location of the installation with respect to Back River, an active shellfish harvesting area

2. Some limited follow-on field survey work (Phase II) is warranted to ensure that contaminant migration is not a problem at Langley AFB.

3. No indication was found from the records or from the interviews of potential contaminant migration from Cape Charles Air Force Station or Bethel Manor off-base housing.

D. Recommendations

1. It is recommended that a limited follow-on field survey program (Phase II) be implemented to verify that contaminant migration is not a problem at Langley AFB. A preliminary scope of the limited Phase II work is as follows:

a. Limited ground-water monitoring at four priority past landfill sites

b. Limited ground-water monitoring at the old chemical leach pit site formerly used for the disposal of pesticides

c. Limited ground-water monitoring at the golf course maintenance building septic tank site because of the potential for past disposal of pesticides in this septic tank

d. Soil sampling at the pesticide/herbicide storage area behind the Entomology Building

e. Soil sampling at the out-of-service transformer storage area because of potential past PCB leaks in this area

f. Soil core samples at four suspected fuel saturated areas

g. Implementation of a limited sampling program in Tabbs Creek and Tide Mill Creek to assess the impact, if any, of leachate migration from past landfill sites into these water bodies

h. If possible, geophysical logging and sampling of a deep water supply well (existence and location needs to be confirmed) to determine water quality conditions in the aquifer underlying Langley AFB

2. In the event that contaminant migration is identified, a more extensive field survey program should be implemented. Details of the limited Phase II program outlined above, including the exact locations of sampling points, should be finalized as part of the Phase II program.

3. No Phase II work is recommended for Cape Charles Air Force Station or Bethel Manor off-base housing.

As a point of information, it is estimated that the total cost for the limited Phase II program should be less than $50,000.

Details are expanded and discussed in the body of the report which follows and which contains supporting data.

I. GENERAL

I. GENERAL

A. Purpose of the Records Search

The main purpose of the Records Search Program is to determine the potential, if any, for migration of toxic and hazardous materials off the Langley Air Force Base (AFB) installation boundaries. The potential for migration of hazardous contaminants is determined by a review of existing information, including a detailed analysis of installation records. Pertinent information includes a history of operations, the geological and hydrogeological conditions which contribute to the migration of contaminants off the installation, and ecological records for evidence of environmental effects resulting from contaminants.

B. Authority

The identification of hazardous waste disposal sites at military installations was directed by Defense Environmental Quality Program Policy Memorandum 80-6 (DEQPPM 80-6) dated June 24, 1980, and implemented by Air Force message dated December 2, 1980, as a positive action to ensure compliance of military installations with the Resource Conservation and Recovery Act (RCRA) and implementing regulations.

C. Introduction

The Records Search comprises Phase I of the Department of Defense (DOD) Installation Restoration Program. If the Records Search indicates that the potential exists for migration of hazardous contaminants off the installation, then Phase II field survey work would be conducted to confirm the presence of the specific migrating contaminants and the extent of migration. The Phase II field survey would provide

the data necessary to determine the magnitude of the restoration or containment required for identified hazardous waste disposal sites. The restoration or containment of the hazardous waste disposal sites comprises Phase III of the Installation Restoration Program.

The engineering firm of CH2M HILL was retained by the Air Force Engineering and Services Center (AFESC) on January 26, 1981 to assemble a team of experts and conduct a Records Search for Langley AFB, Virginia. The installations included in the Records Search were Langley AFB and Bethel Manor off-base housing and Cape Charles Air Force Station, which are supported by Langley AFB (Figure 3). Plum Tree Island National Wildlife Refuge was also included since this site was, until recently, supported by Langley AFB and was used as a bombing range in the past.

A pre-performance meeting was held at Headquarters AFESC, Tyndall AFB, Florida, on February 18 and 19, 1981. Attendees at this meeting included representatives of AFESC, Tactical Air Command (TAC), Langley AFB, and CH2M HILL who would be participating in the Records Search. The purpose of the pre-performance meeting was to provide detailed project instructions for the Records Search, to provide clarification and technical guidance by AFESC, and to define the responsibilities of all parties participating in the Langley AFB Records Search.

Prior to the onsite base visit, various government and private agencies were contacted for documents relevant to the Records Search effort. Appendix B contains the list of agencies contacted during the Records Search.

An onsite base visit was conducted by the CH2M HILL team from March 23 through March 27, 1981. Activities performed during the onsite base visit included a detailed

search of installation records, ground and aerial tours of the installation, and interviews with former and present key base employees. The following individuals comprised the CH2M HILL Records Search team:

1. Mr. Norman Hatch, Project Manager

2. Mr. Steven Hoffman, Assistant Project Manager

3. Mr. Gary Eichler, Hydrogeologist

4. Mr. Brian Winchester, Ecologist

5. Mr. Jerry Aycock, Environmental Engineer

The individuals from the Air Force who participated in the Langley AFB Records Search included the following:

1. Mr. Bernard Lindenberg (AFESC), Program Manager

2. Mr. Gil Burnet (TAC), Command Representative

3. Lt. Karen Hoelscher (Langley AFB), Base Level Point of Contact

D. Installation History

1. Location

Langley Air Force Base, which includes 3,152 acres, is located about 100 air miles south of Washington, D.C., near the southern extremity of the lower Virginia peninsula. The Base is situated between the northwest and southwest branches of Back River, a tidal estuary of Chesapeake Bay. In addition to the 3,152 acres contained within the installation, Langley AFB supports approximately 457 acres of property off the installation as follows:

Bethel Manor Off-Base Housing, 284 acres

Cape Charles Air Force Station, 166 acres

Cape Charles Ground Air Transmitter Receiver (GATR) Site, 7 acres

2. History [1-5][1]

Langley AFB was established in 1917 and has the distinction of being the oldest continuously active Air Force base in the United States; it has played a vital role in the history of aviation. The current host unit is the 1st Tactical Fighter Wing, which represents the second largest wing within the Tactical Air Command. Further details on the history of Langley Air Force Base are included in Appendix C.

E. Environmental Setting

1. Meteorological Data

The climate in the vicinity of Langley AFB is a modified continental type with generally mild winters and warm, humid summers. The mountains to the west and the Chesapeake Bay and Atlantic Ocean to the east are the major factors affecting Langley's climate.

Monthly mean temperatures range from 40°F in January to 79°F in July (see Table 1). Daytime high temperatures during the cold season are usually near 50°, with nighttime lows in the 30's. Maximum winter temperatures are in the upper 70's with minimums as low as 4°. Daytime highs during the summer are usually in the middle 80's, with

[1]References are denoted by brackets [ ].

Table 1
METEOROLOGICAL DATA FOR LANGLEY AIR FORCE BASE
1946 - 1979

Temperature (°F)	JAN	FEB	MAR	APRIL	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
Extreme Max.	77	79	88	95	95	100	101	105	98	94	85	78
Extreme Min.	06	09	19	28	35	43	55	50	44	26	20	10
Mean Max.	48	49	57	67	75	82	86	85	79	69	60	51
Mean Min.	32	33	40	49	58	66	71	71	65	54	43	35
Mean Monthly	40	42	49	58	66	74	79	78	72	62	52	43
Surface Wind												
Prevailing Dir.	N	N	SSW	SSW	SSW	SSW	SSW	SSW	NNE	N	SSW	N
Average Speed	9	10	10	10	9	8	7	7	8	8	8	9
Precipitation (inches)												
Max.	6.5	5.3	10.9	5.5	13.0	10.3	10.9	10.6	15.5	12.5	6.9	7.5
Min.	0.9	0.3	1.2	0.5	0.3	0.4	1.2	0.8	0.2	--	0.3	0.7
Average	3.5	3.4	3.9	2.8	3.9	3.6	4.9	4.9	4.4	3.3	2.9	3.3
Snowfall (inches)												
Mean Amount	3.4	3.0	1.5	Trace	0	0	0	0	0	Trace	Trace	1.5

SOURCE: Climatic Data Records for Langley AFB, Virginia, from 1946-1979.
Headquarters, 5 Weather Wing
Langley AFB, VA

nighttime lows generally around 70°. Maximum temperatures up to 103° and minimum temperatures in the 50's have occurred during July and August. Cloud cover averages around 50 percent, and monthly average relative humidity varies between 67 and 76 percent, depending on the month. Forty-five percent of the hourly relative humidities are below 70 percent, and 16 percent are above 90 percent.

Precipitation is well distributed throughout the year, with maximums in July and August and minimums in November and April. Annual precipitation has ranged from 24 to 57 inches, averaging 44.7 inches per year for the period 1946 through 1979. The monthly average precipitation is approximately 3.7 inches and snowfall averages 9 inches per year. The average pan evaporation rate is approximately 50 inches per year. The evapotranspiration rate in the area is estimated to be about 25 inches per year. Actual evapotranspiration rates would be less than the pan evaporation rate and would be dependent on the type of vegetative cover in the area.

2. Biota

Langley AFB is located on Back River, a small tidal estuary of Chesapeake Bay, and contains many diverse ecological habitats including aquatic, wetland, and terrestrial habitats. Back River contains a diverse variety of shellfish and fish including oysters, blue crabs, grass shrimp, striped bass, weak fish, white perch, silver perch, hogchoker, and bay anchovy.

About 10 percent of Langley AFB is forested woodland including mixed hardwood forests and pine forests. Tidal salt marshes comprise about 450 acres including areas along Tabbs Cree, the Northwest Branch of Back River near the NASA Research Center, and a small tract along Tide Mill

Creek. Typical fauna include white tailed deer, muskrat, mallards, and black ducks. Mosquitoes and Japanese beetles are the most prevalent insect pests requiring regular, widespread control at Langley AFB.

A review of available documents and cursory onsite examination of the biological systems revealed no evidence of significant environmental stress related to hazardous waste or the periodic application of non-persistent pesticides at Langley AFB. A discussion of the types of pesticides and herbicides used at Langley AFB is included in Section II.A.5.b. "Chemical Agents." Further details on the biota of Langley AFB are included in Appendix D.

3. Geology

a. General

Langley AFB is located within the outer coastal plain of southeastern Virginia. The base is situated within the Hampton Flat physiographic province. Elevations of the base range from 5 tc 10 feet above mean sea level. The natural drainage has been modified such that runoff is directed toward Tide Mill Creek, Tabbs Creek, and the Back River.

Soils occurring at the surface consist of silty, clayey sands, with low to moderate permeability. There are three aquifer systems occurring at Langley AFB; all contain water of moderate to poor quality and have little or no development potential for a conventional water supply system.

b. Geological Aspects of Potential Migration

The surface and near-surface strata at Langley AFB are moderate to low in permeability due to the occurrence of clay and silt with the sand. Past disposal practices, with regard to solid waste primarily, could result in the movement of some leachate radially away from the disposal sites. Travel time would be extremely slow due to the low permeability and the very low hydraulic gradient. The shallow water table aquifer would be the only water-bearing formation affected by this contamination since the upper artesian and principal artesian aquifer systems are hydraulically separated from this water table aquifer by clay confining beds. The contamination from past disposal sites would probably be limited to the immediate general vicinity of the disposal site. In any case, there is little likelihood that any ground-water contamination has occurred offsite from Langley AFB, because the direction of ground-water flow within all three aquifer systems is from west to east.

However, even though ground-water movement at Langley within the water table aquifer is generally toward the east, flow paths bend to intercept the branches of the Back River at right angles.

Disposal practices at Langley are intended to prevent ground- and surface-water contamination [22, 24]. There is very limited data currently available regarding ground-water conditions at Langley AFB. Information presented here is from published sources extrapolated to Langley for the most part.

There is apparently one or more old water wells rumored to exist in the LTA area; however, this could not be confirmed from existing records nor field observation.

Further details on the geology of the Langley AFB area are included in Appendix F.

F. Leases

No records were found to document past or present leasing of Langley AFB property for industrial or agricultural purposes. The U.S. Department of Agriculture Soil Conservation Service conducted a survey of Langley AFB property in 1978 and concluded that no prime and unique farmland exists at Langley AFB [28].

No records were found to document past or present leasing of Langley AFB property for grazing purposes. However, Langley does maintain its own riding club with horse stables.

G. Legal Actions

Documentation was found of legal claims filed against Langley AFB regarding past sewage overflow incidents to Back River [46].

There has been much interaction between Langley AFB and the Virginia Water Control Board and the Environmental Protection Agency (EPA), Region III, regarding several incidents of raw sewage overflows into Back River by Langley AFB in 1979 [29]. The problem has occurred with the main pump station 1370, which has had difficulty in pumping into the Hampton Roads Sanitation District (HRSD) force main due to periodic high pressure conditions in the HRSD force main during high rainfall conditions. A subsequent Notice of Violation and an Order of Compliance were issued by the EPA, Region III, to Langley AFB on June 22, 1979, requiring remedial action and assurances to prevent future occurrence of sewage overflows. Langley AFB had already undertaken an extensive corrective action program [30] including:

1. Sewer system rehabilitation to reduce excessive inflow and infiltration of water into the sewage collection system during high rainfall conditions.

2. Upgrading of all 31 lift stations to meet Virginia Sewage Regulations Reliability Class I requirements for continuous operability and alarms.

3. The planned replacement of the main pump station 1370 with a new facility capable of overcoming the high pressure conditions periodically encountered in the HRSD force main. In the interim, portable pumps are utilized at pump station 1370 to prevent sewage overflow discharges to Back River.

An Extension Order was subsequently issued on December 1, 1980 requiring Langley AFB to achieve consistent discharge to the HRSD system by July 1, 1983.

In June 1979, a legal complaint was sent to Langley AFB on behalf of a shellfish harvester regarding financial losses incurred resulting from sewage contamination of Back River. A reply was submitted stating the corrective actions taken by Langley to prevent future occurrences and clarifying that the sewage overflow problem was widespread throughout the surrounding areas and not limited to Langley AFB. Subsequent claims for damages were then filed by nine shellfish harvesters. These claims were denied by the Air Force. A class action suit was then filed on behalf of the shellfish harvesters in the U. S. District Court for the Eastern District of Virginia. The suit is still pending.

On October 26, 1979, a citizen complaint regarding the unauthorized storage of drums at Langley AFB was investigated by the Virginia Water Control Board. Approximately 100 55-gallon drums, some reportedly containing waste oil,

were found near the sanitary landfill site. The drums were subsequently removed and recycled, and the residual waste oil placed in waste oil storage tanks. A follow-up surveillance inspection was conducted on November 16, 1979, and the Virginia Water Control Board reported that "considerable progress had been made toward the removal of the drums and the general clean-up of the waste oil storage area [31]. The surveillance inspection included sediment sampling of 9 sites for evidence of contamination. The sampling sites (Figure 4) included in the surveillance were as follows:

Station 1	Brick Kiln Creek--Route No. 172 Bridge
Station 2	N.W. Branch of Back River--Cedar Point
Station 3	Tabbs Creek--Confluence with N.W. Branch of Back River
Station 4	Tabbs Creek--Dirt road off Weyland Road
Station 5	Tabbs Creek--Adjacent to landfill
Station 6	N.W. Branch of Back River between Tin Shell and Willoughby Point
Station 7	S.W. Branch of Back River--Right off Langley View
Station 8	S.W. Branch of Back River--Route No. 278 Bridge
Station 9	S.W. Branch of Back River--Confluence with Tide Mill Creek

The results indicated no contamination of sediments by pesticides, herbicides, or polychlorinated biphenyls (PCBs). The sediments were also analyzed for heavy metals. The only

heavy metal of significance found was total chromium, with elevated chromium levels above other sampling stations found in the Tabbs Creek sampling station No. 4. No follow-up surveillance work was deemed necessary by the Virginia Water Control Board.

II. PAST AND CURRENT ACTIVITY REVIEW

II. PAST AND CURRENT ACTIVITY REVIEW

A. Installation Operations

1. Industrial Operations

The major industrial activities at Langley AFB are vehicle maintenance, aircraft maintenance, and corrosion control operations, including aircraft washracks and paint booths. No record of any past or present electroplating operations at Langley AFB were found.

Maintenance operations areas typically use degreasing solvents such as 1,1,1-trichloroethane, methyl ethyl ketone, and toluene. Typical maintenance operations using degreasing solvents include welding shops, bearing shops, hydraulics shops, aircraft ground equipment shops, and wheel and tire shops. Another common solvent used in place of trichloroethane is PD 680, also known as "safety solvent," which contains a mixture of aromatic and aliphatic hydrocarbons.

Paint shops commonly use zinc chromate primers and polyurethane paints. Common solvents and thinners used in paint shop areas include methyl ethyl ketone and toluene. Phenolic paint stripping compounds are also used.

Waste oil and solvents from the base maintenance and repair shops are collected in 55-gallon drums and taken to fiberglass bulk storage tanks. The empty drums are then either recycled on base or hauled offsite by a contractor.

Washrack operations typically use alkali soaps and detergents, which have replaced phenolic type cleaners used in the past.

Langley AFB also operates a large printing plant at Building 750 with offset printing units using standard printing inks and solvents.

In summary, numerous small-scale maintenance operations comprise the major industrial activity at Langley AFB. No large-scale aircraft overhaul or painting activities are conducted at Langley AFB. A summary of industrial operations is given in Table 2.

2. Lessee Industrial Operations

No records were found to indicate any past or present lessee industrial operations at Langley AFB.

3. Laboratory Operations

There is no classified research currently being conducted at any laboratory facility at Langley AFB. There are a number of routine chemical handling laboratory operations at Langley AFB, including five photographic processing laboratories, two non-destructive instrument testing laboratories, one precision equipment calibration laboratory, two fuels testing laboratories, and clinical laboratories associated with the base medical and dental clinics. An inventory of existing laboratory facilities is given below: [32]

Building Number	Laboratory Type	Year Completed
23	Photo Reconnaissance Lab	1966
1334	Photo Reconnaissance Lab	1977
1335	Photo Reconnaissance Lab	1977
788	Base Photo Lab	1932
801	Base Photo Lab	1979
777	Non-Destructive Instrument Testing Lab	1979
782	Non-Destructive Instrument Testing Lab	1976
782	Precision Equipment Calibration Lab	1942
92	Dental Clinical Lab	1975
257	Medical Clinical Lab	1966
741	Fuels Testing Lab	1972
744	Fuels Testing Lab	1953

Table 2
INDUSTRIAL OPERATIONS SUMMARY [32]

Building Location	Industrial Activities
41	Petroleum, Oil, and Lubricants (POL) Vehicle Washrack
47	Vehicle Washrack
152	POL Vehicle Washrack
224	Auto Hobby Shop
225	Vehicle Service Rack--Lubrication Shop
227	Transportation Motor Pool Washrack
320	Organizational Maintenance Shop
337	Weapons Release Shop
338	Hangar Maintenance, Aircraft Maintenance Shop, Organizational Maintenance Shop
340	Aircraft Ground Equipment (AGE) Washrack, AGE Maintenance Shop
346	Vehicle Service Rack--Lubrication Shop
351	Aircraft Maintenance Shop, Engine Inspection and Repair Shop, Hangar Maintenance
369	Aircraft Maintenance Dock, AGE Maintenance Shop
371	Aircraft Maintenance Shop, Organizational Maintenance Shop
372	Aircraft Maintenance Dock
373	Fuel System Test Cell Maintenance Dock
374	Aircraft Washrack, Aircraft Maintenance Dock
375	Fire Department Washrack, Fire Truck Maintenance Shop
377	Aircraft Washrack Pad
398	Munitions Shop

Table 2
Page 2
INDUSTRIAL OPERATIONS SUMMARY

Building Location	Industrial Activities
606	Paint Spray Booth, Welding Shop
613	Paint Spray Booth
621	Motor Pool Maintenance Shop, Battery Shop
631	Vehicle Service Rack--Lubrication Shop
633	Civil Engineering Equipment Shop and Outdoor Washrack
728	Aircraft General Purpose Shop
729	Engine Test Cell
730	Engine Test Cell
734	Engine Test Cell
736	Aircraft General Purpose Shop
737	Engine Test Cell
747	Refueling Vehicle Maintenance Shop
743	Refueling Yard Washrack, Vehicle Service Rack--Lubrication Shop
750	Printing Plant, Organizational Maintenance Shop
751	Aircraft Inspection and Maintenance, Hangar Maintenance, Organizational Maintenance Shop
752	Engine Inspection and Repair Shop, Weapons Release Shop, Hangar Maintenance, Aircraft General Purpose Shop
753	Aircraft Inspection and Maintenance, Hangar Maintenance, Organizational Maintenance Shop
754	Hangar Maintenance, Aircraft General Purpose Shop

Table 2
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INDUSTRIAL OPERATIONS SUMMARY

Building Location	Industrial Activities
755	Aircraft General Purpose Shop, Aircraft Maintenance Shop, Electronics Communications Maintenance Shop
756	Hangar Maintenance, Aircraft Maintenance Shop
757	AGE Repair Shop, Organizational Maintenance Shop, Aircraft Maintenance Shop
777	Aircraft General Purpose Shop
781	Paint Spray Booth, Aircraft General Purpose Shop
782	Aircraft General Purpose Shop
794	Munitions Shop
894	Organizational Maintenance Shop
1009	Vehicle Service Rack--Lubrication Shop
1053	Missile Assembly Shop
1061	Munitions Shop
1065	Munitions Shop
1362	Hangar Maintenance

Standard photographic processing chemicals are used at all of the photographic processing labs; spent solutions are processed to recover silver content and then discarded to the sanitary sewer system. Waste film is disposed of in a small classified incinerator located near Building 23.

The non-destructive testing labs and the precision equipment calibration lab use basically dry processes. Small quantities of solvents are used for cleaning; waste solvents are collected and sent to waste oil storage tanks.

The clinical laboratories dispose of infectious and pathological wastes in a pathological incinerator located at the Veterans Administration Hospital. Common chemical solutions are discarded to the sanitary sewer system.

Fuel testing labs perform routine, quality control testing of fuels and petroleum products used on the base. Waste oil is collected and sent to the waste oil storage tanks.

There are no water quality testing laboratories at Langley AFB. All water quality and environmental testing is done at Brooks AFB, Texas, and bacteriological analyses are performed at Ft. Eustis, Virginia.

4. Training Areas

The bombing range presently being used is the Dare County Range located 70 nautical miles south of Langley in eastern North Carolina. Small arms training, however, is conducted on base near the Entomology Building.

Explosive Ordnance Disposal (EOD) training is conducted at Langley using only light explosives with a limit of one blasting cap [33]. No munitions disposal operations are currently being conducted, but past experience has proven that unexploded ordnance (UXO) may be found anywhere on Langley. Plum Tree Island has served as an impact area in the past, but there is no documentation regarding UXO which may be encountered there.

Fire training conducted on-base may provide for the migration of pollutants into nearby surface waters (Tabbs Creek). In the past, fire training waste (runoff, foaming agents, etc.) was allowed to runoff into nearby surface waters. Currently, a new fire training facility is under construction and provides for the containment of the waste, pretreatment in an oil/water separator, and effluent discharge to the sanitary sewer.

5. Toxic/Hazardous Materials--Handling and Storage

Due to the low quantity of toxic/hazardous materials stored or handled on Langley AFB, the potential for migration of these materials off base, endangering public health or the environment, is relatively low. Possible hazards may result from material spillage, but migration off base would be unlikely, due to extensive spill control contingency procedures [34].

Areas of special interest or concern would be the fuel storage areas, waste oil storage areas, and the polychlorinated biphenyls (PCBs) storage area, which are discussed in the following sections.

To date, no documentation or indication of serious chemical spills at Langley AFB have been found.

a. Industrial Chemicals

The substances used in largest quantities at Langley AFB are fuels and oils. It is suspected that fuel has saturated the soil in several storage areas over the last 25 years due to leaking valves, broken fuel pipes, tank cleaning, and sump drain-off. Currently, corrective action is underway to minimize fuel spills.

Waste oil and other waste petroleum products are purchased by an outside contractor through the Defense Property Disposal Office. Waste products (mostly waste oils and solvents) are stored in two locked underground bulk storage tanks (6,000- and 8,000-gallon capacity) and 55-gallon drums located at various buildings within the base [35].

Other areas on base handling industrial chemicals that may find their way into the environment include areas such as the photo lab, medical facilities, painting (corrosion control), aircraft maintenance, and washing/cleaning racks. Typical chemicals include solvents for degreasing operations, metal-containing primers, paint thinners, photo processing solutions, and pathogenic waste which is incinerated off-base.

Langley AFB has not had a major reportable PCB spill, but the potential for one does exist through out-of-service transformers. In the past, PCB transformers were stored in a gravel fenced area. Some past minor leakage was reported in this area.

A comprehensive listing of hazardous and toxic substances stored on Langley AFB is maintained by the Base Bioenvironmental Engineer and Base Environmental Coordinator.

b. Chemical Agents

No documentation or indication of the manufacture, storage, use, or disposal of military chemical agents at Langley AFB was found.

Civil Engineering (CE) Entomology specialists are responsible for the dispersion of herbicides and pesticides for pest/vector control on an as-needed basis. A general listing of chemicals used is contained in Appendix D.

A combination of ground-based and aerial operations is utilized for the application of chemical agents for mosquito control. CE Entomology personnel disperse a mixture of Dibrom and Heavy Aromatic Naphtha (HAN) from ultra-low-volume (ULV) foggers for adult mosquito control. Adulticiding operations commence in the spring, when Environmental Health Services (EHS) indicates that trap counts are up, and fogging continues until October. Fogging routes are established to cover main base, flight line, residential, ammo storage, and golf course areas. When base-wide mosquito numbers are high, fogging is attempted five nights per week from 2100 to 2400 hours using both machines. During periods of lower mosquito abundance, only one ULV machine is used, and the only areas treated are those with high mosquito counts. Standing water on base with restricted outflow is also treated with Altosid briquets for larval mosquito control.

Since the primary pest/vector species in the area is mosquitoes, which breed in the extensive and inaccessible salt marshes surrounding Langley AFB, the technique of aerial dispersal of insecticides has been used for many years at Langley AFB to control mosquitoes. From 1948 to 1957, a variety of organochlorine compounds including DDT, chlordane, dieldrin, and lindane was disseminated. From 1957 through 1967, the organophosphate compound malathion was used almost exclusively. Since 1968, Dibrom has been the only insecticide applied by aircraft for adult mosquito control. Appendix D contains a summary of aerial spray operations at Langley AFB for 1948 through 1978.

In order to control various other pests on-base, numerous pesticides have been used on a more locally specific and as-need basis. A listing of the various chemicals used and areas applied is given in Appendix G.

c. Biological Agents

No evidence of the manufacture, storage, or use of military biological agents was found at Langley AFB.

The only biological agent found to have been used on base was a milky spore (Bacillus popilliae) formulation used for the control of Japanese beetles in the grub stage during 1972. Over 700 acres were treated.

d. Radiological Materials--Permits and Licenses

No records were found to indicate the past or present disposal of radioactive materials at Langley AFB. However, one of the interviewees indicated that low-level radioactive materials, such as electron tubes and self-luminous dials, may have been buried on what was previously known as the Oyster Point Munitions Storage Site. The

suspected material (unconfirmed) was reported to be buried under 5 feet of earth cover during the early 1950's. Exact information regarding location, depth, and type of material buried is unknown. The site is currently owned by the Oyster Point Development Corporation. Action is currently underway to confirm the report and, if necessary, to help the current property owner in locating and disposing of the buried material.

B. Disposal Operations

Currently, all waste disposal is conducted off base, including wastewater treatment of the Hampton Roads Sanitation District Treatment Plant, and solid waste disposal to a jointly used incinerator (NASA, Langley AFB, and the City of Hampton). The incinerator ashes are landfilled in a landfill owned and operated by the City of Hampton.

In the past, however, Langley has treated its own wastewater and has conducted disposal of solid waste and debris in on-base landfills. No documentation or indication of hazardous materials disposed of in on-base landfills was found. The major materials classified as hazardous which were disposed of on-base include pesticide/herbicide containers, some solvents with containers, and various waste oils and petroleum products with containers.

1. Liquid Wastewater Treatment

a. Sanitary Wastewater Treatment

Currently, most of the wastewater generated at Langley AFB and Bethel Manor Housing Area (off-base housing) is collected and discharged to the Hampton Roads Sanitation District (HRSD) sewage collection system and treated by the HRSD James River Treatment Facility.

In the past, Langley has had several wastewater treatment facilities. Three of the four treatment facilities were secondary, biological-type facilities, and only the Lighter-Than-Air (LTA) plant afforded primary treatment [36]. All plants were equipped to disinfect the final effluents. The four facilities are listed and described below.

Facility Name	Date Started	General Type of Facility
Heavier-Than-Air (HTA) Sewage Treatment Plant	1917	Secondary treatment using trickling filters
Lighter-Than-Air (LTA) Sewage Treatment Plant	1930	Primary treatment
Shellbank Sewage Treatment Plant	1943	Secondary treatment using trickling filters
Bethel Manor Sewage Treatment Plant	Late 1940's	Secondary treatment using activated sludge

No documentation of updates or modifications to the facilities was found. In 1968 all facilities were abandoned and all sewage collected was discharged to the HRSD sewage collection system for treatment.

Records indicate that there are 10 active septic tanks on Langley AFB. The list below indicates septic tank location, ground elevation, and distance from nearest water. Figure 11 shows septic tank locations associated with Langley.

Septic Tank Locations

Septic Tank No.	Building Number	Area Serviced	Ground Elevation (feet)	Distance from Water (feet)
1	16	LaSalle Gate	< 5	150
2	401	King St. Gate	> 5	> 50
3	299	West Gate	10	> 50
4	1380	GCA (2)	> 5	> 50
5	894	Aero Club	> 5	> 50
6	1301	Golf Ground Maintenance	> 5	> 50
7	1304	Golf Green #2	5	> 50
8	1041	Horse Stable	> 5	> 50
9	19	Mars	> 5	> 50
10	728	ITFW Test Cell Office	5	> 50

All septic tanks are in compliance with State and local requirements with regard to distance from shellfish waters and tributaries to shellfish waters [37].

b. Industrial Wastewater Treatment

Industrial wastewater discharges at Langley AFB include oil/water separator effluents, paint booth washdowns, general wastewater from laboratories such as photo labs and medical facilities, swimming pool filter backwash, vehicle and equipment washracks, cooling tower bleed-off, and vehicle maintenance facilities.

The major contaminant in the various industrial point discharges is oil and grease, and numerous oil/water separators have been installed to alleviate this problem. Figure 12 shows the locations of the existing oil/water separator facilities at Langley AFB. Most of the 26 existing oil/water separators have been installed within the last 5 years [38].

In the past, many of the industrial wastewater discharges were tied into the storm drainage system. Most of these were discharge from oil/water separators, cooling

tower bleed-offs, and washdowns from various maintenance areas. Over the past few years, however, most of the industrial discharges have been connected to the sanitary sewage collection system [39].

c. Holding Ponds

Currently, there are no holding ponds at Langley AFB. Based on an interview with personnel familiar with past waste operations conducted at Langley, a sewage lagoon was believed to have been in operation in the Lighter-Than-Air (LTA) area adjacent to the Non-Commissioned Officers (NCO) club. No documentation was found to indicate when the lagoon was in operation, but based on the interview it is believed to have been shut down in the mid-1940's.

d. Stormwater Drainage

Stormwater is collected in a series of ditches, box drains, and catch basins and transmitted to the Back River or Tabbs Creek, which flows into the Back River. Runoff in some areas enters the Back River by sheet flow across the low, flat areas of the base. The Back River, which is the receiving water body for all stormwater from Langley AFB, discharges directly into Chesapeake Bay.

Tabbs Creek originates on NASA property and receives stormwater and ground-water discharge. The creek passes near and through old or recently inactivated landfills and could be receiving runoff and leachate from those areas.

2. Solid Waste Disposal

a. Sanitary Landfill

Langley AFB currently disposes of its solid waste in a 200-ton-per-day solid waste incinerator. The incinerator is part of a joint refuse-fired steam generation plant for disposal of solid waste from Langley AFB, NASA Research Center, the City of Hampton, Ft. Monroe, and the Veterans Administration Hospital in Hampton. The facility is located on NASA property and is operated by the City of Hampton. Langley AFB began sending its solid waste to the new incinerator in January 1981, at which time all landfill activities at Langley ceased. There is some evidence that bulky material and demolition wastes are still being stockpiled and perhaps disposed of onsite.

Interviews with past and present key base employees resulted in the identification of 11 past landfill sites at Langley AFB (see Figure 13). Photographs of some of the sites are included in Appendix A. A brief summary of the sites is given below:

- Site No. 1 was used from 1940 to 1950 for disposal of dredged material from Back River and demolition debris.

- Site No. 5 was used in the 1930's and 1940's as a general landfill area and is located in the Shellbank area of the base.

- Site No. 7 was used from the late 1940's until the early 1960's as a general landfill area and is also located in the Shellbank area of the base.

o Site No. 10 was used from 1953 to 1965 and has been reclaimed as part of the existing golf course.

o Site No. 11 was used from 1965 to 1972 and is located across Tabbs Creek from Site No. 10.

o Site No. 12 was the most recent landfill site and was used from 1972 to 1980. The most recently used portion of the site is located at the northwest corner and is currently in the process of closure.

o Site No. 13 was identified in the interviews as a small landfill trench that was used for a very short period of time (about 1 month) in the past.

o Site No. 15 was identified as a site for the disposal of old vehicles and construction debris prior to 1940. Apparently an old fire truck was buried at the site in the past.

o Site No. 17 was used as a trash burning ground and landfill area prior to 1945. Trash burning occurred during the winter months when landfill operations were difficult due to high water table conditions.

o Site No. 18 was used as a landfill during the 1930's and is located at the northwest corner of the base adjacent to NASA property.

o Site No. 20 is included because of its proximity to Langley AFB property. The site is a private operation located just outside Langley property and is known as Williams Pit. This site has been the object of odor complaints in the past.

Although there is no detailed documentation of the types of materials deposited in past landfill areas at Langley AFB, the interviews gave an indication of the activities and types of materials that may have been buried in these landfill areas, as follows:

o Langley AFB was not heavily involved in industrial activities, and the majority of the waste materials sent to landfills was typical of municipal-type refuse.

o The interviews indicated that, in general, the types of materials sent to Langley landfills in the past may have included some waste oil and solvents in drums, old paints and thinners, old battery casings, empty pesticide and herbicide containers, avionics and electron tubes in small quantities, tires, fabrics, adhesives, construction debris, and sanitary wastewater treatment plant sludge.

o Empty pesticide and herbicide containers (5-gallon capacity) from the Entomology Building were routinely crushed and sent to landfill areas for disposal. These included empty containers of DDT and dieldrin pesticides at the rate of about 35 empty containers per year. The containers were rinsed prior to disposal. Plastic liners from Dibrom tanks were also sent to landfills for disposal. Landfill sites that probably received these materials include Sites No. 10 and 11.

o Old paint containers from the paint shops were routinely sent to landfill areas in the past. The main solvents used in the paint shops included Barsol (a refined kerosene), alcohol, and lacquers. Waste solvents and paints were placed in 5-gallon containers and sent to landfills for disposal. Landfill sites that probably received these materials include Sites No. 5, 7, 10, 11, 12, and 17.

- Salvage yard operations began in 1958 for the salvage and sale of metal scrap, iron, copper, aluminum, and old batteries. It is likely that prior to 1958 these salvageable items were sent to landfills for disposal. Landfill sites that probably received these materials include Sites No. 5, 7, 10, 17, and 18.

- Large quantities of fly ash from coal burning were routinely sent to landfill areas for disposal, including up to 20 truckloads per day (5-cubic-yard trucks) during the wintertime. Coal was used for heating at Langley AFB from 1917 until the early 1960's, when conversion was made to fuel oil. Landfill areas that probably received these materials include Sites No. 5, 7, 10, 17, and 18.

- The flight line at Langley AFB was sandblasted and repainted after World War II. The paint chippings, consisting of lead base paint chips, were disposed of in the sanitary landfill. Landfill areas that probably received these materials include Sites No. 5 and 7.

- No indication was found that electroplating operations were conducted at Langley AFB in the past. Consequently, it is unlikely that toxic heavy metal sludges resulting from electroplating operations were disposed of in Langley landfills.

- None of the interviewees recalled any incidents in the past in which large quantities of unusual, toxic, or hazardous wastes were sent to Langley landfills for disposal.

i. <u>NASA Research Center</u>

Landfill Sites No. 10, 11, and 12 were used by Langley AFB, NASA Research Center, Ft. Monroe, and the Veterans Administration Hospital in Hampton. Interviews with NASA personnel indicated that materials that may likely have been sent to the Langley landfill sites in the past include some waste oils and solvents in drums, building supply waste (including asbestos pipe covering), empty pesticide and herbicide containers, and waste photographic films. Some typical chemistry lab waste materials may also have been sent to the landfill. The interviewees felt that it was unlikely that any exotic chemicals or radioactive material were ever sent to the Langley landfills. Beginning in 1969, all waste chemicals and hazardous waste materials at NASA were stored in designated protected areas and not sent to landfills for disposal. Landfill sites that probably received these materials include Sites No. 10, 11, and 12.

ii. <u>Veterans Administration Hospital</u>

The Veterans Administration Hospital in Hampton began sending refuse to Langley AFB in 1974. This refuse consisted of municipal-type waste and did not include unusual toxic, hazardous, or infectious wastes.

iii. <u>Ft. Monroe</u>

Ft. Monroe began sending refuse to Langley AFB in 1955, consisting mainly of municipal-type waste from family housing areas and troop facilities. There was an incident in 1977 concerning the disposal of mercury-contaminated sand [41]. The sand was contaminated by a mercury spill (8 pounds) at the Big Bethel Water Treatment Plant. After cleanup, approximately 16 drums of sand contaminated with less than 1 pound of mercury were sent to

the Langley landfill (Site No. 12) for disposal. The contaminated sand was treated by chemical fixation prior to landfill disposal.

iv. Ground Tour

A ground tour of landfill Sites No. 11 and 12 indicated that the most recent landfill area (No. 12) was divided into two sections. The south section contained mostly construction debris with some containers and large metal objects and was mostly uncovered. The north section contained putrescible material and garbage and was covered with soil but not graded.

A ground tour of landfill Site No. 7 indicated some redish-brown discoloration on the bottom and sides of a drainage ditch, which is evidence of some leachate entering the ditch. An analysis of the drainage ditch water was conducted in 1974 and showed no indication of contamination.

v. Landfill Surveillance Analyses

Some limited data is available resulting from surveillance and analysis work performed at some of the landfill sites. A sediment sampling program was conducted in 1979 as a result of a citizen complaint regarding the unauthorized disposal of drums at the old landfill Site No. 11. The Virginia Water Control Board investigated the complaint and collected sediment samples from Tabbs Creek and Back River for heavy metals, pesticides, herbicides, and PCB's analyses to determine if these water courses were contaminated [31]. All results were satisfactory. Some elevated total chromium concentrations were noted in Tabbs Creek. These levels were probably the result of past NASA cooling tower bleed-off discharges unrelated to any landfill activity.

In 1976 waste samples were taken from the small stream adjacent to landfill Site No. 12 and analyzed for heavy metals, cyanides, phenols, oil and grease, nutrients, total organic carbon, and chemical oxygen demand. No significant concentrations of heavy metals, cyanides, or phenols were found. Some elevated chemical oxygen demand and total organic carbon concentrations were detected. No reason was given for the presence of this organic material in the stream [42].

In 1974, drainage ditch samples upstream and downstream of the old landfill Site No. 7, as well as a ground-water sample from the landfill site, were collected and analyzed. No significant concentrations of heavy metals, phenols, cyanides, or other contaminants were detected [43].

b. Contaminated Waste

Langley AFB currently disposes of waste oil and solvents in a bulk storage facility (6,000-gallon and 8,000-gallon fiberglass tanks). The Defense Property Disposal Office (DPDO) periodically issues a contract to remove the waste oil for reuse or disposal offsite. The waste oils and solvents are collected in 55-gallon drums at various locations throughout the base and transported to the bulk storage tanks for disposal. Three other smaller buried tanks are also used to store waste petroleum products. During the helicopter overflight, a number of drums were observed at the old landfill Site No. 11, which is adjacent to the waste oil storage tank area. Apparently, the drums were deposited at this location without proper authorization. Standard procedure calls for all waste oil collection drums to be reused on the base or hauled offsite by a contractor. A ground tour of this unauthorized drum disposal area revealed 75 to 125 drums in various states of deterioration. Most of the drums had previously contained aircraft cleaning fluid,

ethylene glycol, and methanol. The majority of the drums were empty but some did contain residual material. No obvious signs of vegetative stress were observed in the drum disposal area.

Langley AFB has an extensive fuels handling system including a liquid fuel barge unloading dock, a liquid fuel pump station, various liquid fuel transmission lines, storage tanks, and flight line hydrant fueling stations. Currently, all contaminated fuels are salvaged for reuse or hauled offsite by a contractor. Sludges removed from JP-4 storage tanks were typically air dried and landfilled in the past. These sludge volumes were small and typically contained no toxic heavy metal residues. No documentation was found to indicate the disposal practice for sludge from leaded aviation gasoline storage tanks in the past. It is likely that these lead-containing sludges were also landfilled; however, sludge volumes are believed to be small.

Interviews with past and present key base employees resulted in the identification of 11 possible contaminated areas or disposal sites, other than landfill sites or burning grounds, at Langley AFB. Locations of the 11 sites are shown on Figure 13, and photographs of some of the sites are included in Appendix A.

Sites No. 3, 4, 16, and 21 were identified during the interviews as possible fuel-saturated areas. Site No. 3 contains an old underground fuel line which was abandoned in 1965. This fuel line was identified as having problems with pinhole leaks when it was in use. Site No. 4 contains old underground fuel storage tanks which were part of the old aqua fuel distribution system. The tanks were abandoned in 1965, emptied, and filled with sand. Several of the interviewees indicated that oil has been observed

seeping from the ground in the above areas after a heavy rainfall. Noticeable hydrocarbon odors have also been reported in the storm sewer adjacent to Site No. 4.

Sites No. 2, 6, and 8 were identified as old wastewater treatment plant sites that were abandoned in 1968. Site No. 6 was also identified as a past disposal area for wastewater treatment plant sludge. Site No. 6 was also the location of the old Entomology Building, which was demolished in the 1960's. It is likely that debris from the demolition of this building was sent to landfill for disposal, probably landfill Site No. 11.

Site No. 14 was identified as the location of an old chemical leach pit which apparently has been filled in. The leach pit was located near the firing-in abutment (Building 1303) and was used by Entomology personnel for the collection of washdown and spills associated with the loading of pesticide on spray planes. The main contaminant entering the leach pit was malathion pesticide for mosquito control.

Site No. 19 is the existing storage area for out-of-service electrical transformers containing PCBs. Most of the transformers are currently stored in a protected building on a concrete pad (Building 1335). Out-of-service transformers were previously stored outside the building on a gravel base, prior to the effective date of PCB regulations in 1979. Documentation indicates that some leakage of PCB material may have occurred in this outside storage area. An analysis of the contents of the transformers was conducted in 1979 (see Appendix H). PCB material was detected in 22 of the transformers, whereas three of the transformers tested contained no PCB residue.

Site No. 24 is the location of the existing waste oil storage area. Several of the interviewees and a visual inspection indicated that spillage of waste oils and solvents is a common problem at the site. This is apparently the result of difficulty in maneuvering the 55-gallon waste oil drums for emptying into the storage tanks.

Site No. 25 is a pesticide and herbicide storage area located behind the existing Entomology Building. Pesticide and herbicide drums are stored on a gravel base in a fenced area. Some interviewees indicated that spillage, primarily of malathion, has occurred in this area in the past.

Other sites of interest include Sites No. 9 and 23. Site No. 9 was identified as a past disposal area for gas cylinders from the LTA area prior to 1935. All buried cylinders found to date in this area have been empty or filled with sand. Site No. 23 was identified as a major coal storage area at Langley when coal was used as the primary fuel for heating.

3. Demolition and Burning Ground Areas

a. Demolition Areas

Currently there are no munitions disposal operations being conducted at Langley AFB. All unexploded ordnance (UXO) disposal work is done at Fort A.P. Hill, Bowling Green, Virginia.

Although UXO disposal operations have been conducted in the past on Plum Tree Island, no documentation was found describing the type of munitions or the exact dates. However, the interviews indicated that UXO operations were conducted until about 1963. Plum Tree Island, including

the contiguous Big Salt Marsh area, was also used as a bombing range in the past, probably during the 1920's. The exact dates of bombing range activity could not be documented. The Plum Tree Island area, comprising approximately 3,275 acres, was transferred to the U.S. Department of the Interior in September 1972 and was designated as a National Wildlife Refuge. No documentation of demilitarization of the site was found in the records. The interviews indicated that UXO has been occasionally found in the waters off Plum Tree Island by area fishermen.

Proficiency range operations for explosive ordnance disposal (EOD) training is currently conducted at Langley AFB on a small scale using an extremely limited amount of explosives [44]. The proficiency range is currently located in Building 1303, which is known as the firing-in abutment (Figure 14). Detonation of explosive charges has been performed at the proficiency range in the past with permission of the Base Commander. The firing-in abutment has also been used in the past by aircraft for sighting-in of machine guns. A new EOD proficiency range site with an explosive limit of 2.5 pounds has been proposed to replace the existing facility.

It is believed that the area currently being used as a golf course served as a bombing range in the past, probably in the early 1920's. Maintenance personnel and contractors have unearthed several old practice bombs in this area. The practice bombs found to date have been pre-World War II vintage, ranging from 2 to 4 feet in length, and have been empty or filled with sand. Several large bomb craters have also been discovered in a smaller area of the golf course (Figure 14).

b. Burning Grounds

No recorded documentation was found to indicate the locations of past burning grounds at Langley AFB. However, the interviews indicated that waste oil and solvents were commonly burned in the past in several designated burning ground areas (Figure 15). The waste oil burning was usually done in a dug pit area; the practice was discontinued in the early 1960's. Currently, waste oil and solvents are collected in designated bulk storage tanks. The contents of the tanks are periodically hauled offsite by a contractor. A small amount of contaminated JP-4 is currently used by the Fire Department for fire training exercises which are held periodically in the vicinity of Building 1303.

There was an active burning ground for disposal of trash in the past. The site was located behind Building 965 and was used primarily during the winter months when landfill operations were difficult. The use of the burning ground was discontinued after 1947 when the Air Force took control of the Langley installation.

4. Demilitarization

No documentation was found to indicate that any type of demilitarization operations were conducted at Langley AFB.

5. Water Quality

The major surface-water body bordering Langley AFB is Back River, a tidal estuary of Chesapeake Bay. Pollutant loading to Back River is small, with most loading coming from non-point sources. General water quality in Back River is good, with low nitrogen and phosphorus levels and adequate dissolved oxygen levels. Fecal coliform bacteria in Back River is generally low.

Back River is a sensitive water body because of shellfish harvesting activities. Periodic incidents of sewage overflows during heavy rainfalls have resulted in periodic high coliform bacteria counts, and some portions of Back River have been temporarily closed to shellfish harvesting.

Ground water in the area is saline and not conducive to development as a potable water supply. Langley AFB has an active water quality monitoring program, including 11 sampling stations located at various drainage ditches and conduits throughout the base (Figure 16). Sampling results show that certain contaminants, primarily phenols, oil and grease, and total chromium, have periodically fluctuated slightly above normal background levels (Table 3).

Corrective actions have been taken to alleviate these fluctuations, including the installation of 26 oil/water separators at various industrial discharge sources, discontinuation of the use of phenolic cleaners in washrack operations, and elimination of chromium in cooling tower treatment.

Further details on water quality are included in Appendix I.

6. NPDES Permits

Langley AFB does not have an NPDES permit number, since it has no wastewater discharges to surrounding surface waters. All wastewater, domestic and industrial, is collected and discharged to the HRSD sewage collection system and treated off base. HRSD, however, has issued an industrial wastewater discharge permit for the Langley AFB wastewater discharges. HRSD also routinely monitors the wastewater

Table 3
PERIODIC POLLUTANTS FROM
WATER POLLUTION SAMPLING SITES

Site No.	Periodic Pollutants[1]
1	Oil and grease, phenols, cadmium, total chromium, and chlorides
2	Phenols and chlorides
3	Phenols, total chromium, and chlorides
4	Phenols, total chromium, and chlorides
5	Phenols, iron, and chlorides
6	Phenols, iron, chlorides, and surfactants
7	Phenols, irons, and chlorides
8	Phenols, iron, magnesium, and chlorides
9	Phenols, ircn, and chlorides
10	Phenols, total chromium, iron, and chlorides
11	Phenols and chlorides

[1]Pollutants which are periodically slightly higher than normal background levels.

discharged by Langley AFB. A copy of the HRSD permit and recent wastewater monitoring results for Langley AFB are included in Appendix J.

III. INSTALLATION ASSESSMENT

III. INSTALLATION ASSESSMENT

A. Conclusions

1. The Langley AFB Records Search did not reveal specific documentation of past hazardous waste disposal at the installation or the migration of contaminants off the installation. However, the potential exists for contaminant migration due to the following factors:

a. The age of the installation (64 years) and the large number of past disposal sites (11) at the installation

b. The lack of adequate records concerning the types of materials disposed of at the installation disposal sites

c. The high ground-water table conditions at the installation

d. The environmentally sensitive location of the installation with respect to Back River, an active shellfish harvesting area

2. Some limited follow-on field survey work (Phase II) is warranted to ensure that contaminant migration is not a problem at Langley AFB. This conclusion is based upon an evaluation of the 11 past landfill disposal areas using the following criteria:

Criterion	Weighting Factor
1. Duration of time that the landfill was in operation.	1
2. Lack of security at the landfill, e.g., locked, fenced enclosures to prevent unauthorized use by base contractors.	1
3. The presence of streams, creeks, or drainage ditches near the landfill site.	1
4. The presence of streams, creeks, or drainage ditches running through the landfill site.	1
5. The past use of the landfill site by facilities other than Langley AFB, e.g., NASA, Ft. Monroe, the VA Hospital.	1
6. Records and/or interviews indicate that some hazardous waste materials, e.g., waste oils, and solvents, may have been disposed of in the landfill site.	5
7. Records and/or interviews indicate that large quantities of hazardous materials were routinely disposed of in the landfill site.	10
8. Existing water quality monitoring data confirms the presence of hazardous contaminates in surface waters or groundwater at or near the landfill site.	10
9. Existing water quality monitoring data shows the presence of contaminants, though not confirmed hazardous contaminants in surface waters or groundwater at or near the landfill site.	1
10. The landfill has been the subject of past citizen complaints and/or surveillance activities by regulatory agencies.	1
11. The landfill location and the hydrogeology of the area indicates a high potential for contamination of potable groundwater supplies.	10
12. High ground-water table conditions at the landfill site.	3

The results, summarized in Table 4, indicate a high priority for past landfill Sites No. 7, 10, 11, and 12 for limited follow-on field survey work.

3. Additional limited follow-on field survey work is warranted for the following suspected contaminated areas:

Description	Reason For Limited Phase II Work
Old Chemical Leach Pit (Site 14 on Figure 14)	Former waste pesticide disposal
PCB Transformer Storage Area (Site 19 on Figure 14)	Possible PCB leaks from out-of-service transformers in outside storage area
Pesticide/Herbicide Storage Area (Site 25 on Figure 14)	Possible leaks from pesticide and herbicide containers in outside storage area
Sites 3, 4, 16, and 21 on Figure 14	Suspected fuel-saturated areas
Golf Course Maintenance Building Septic Tank (Site 7 on Figure 11)	Possible past disposal of pesticides and herbicides into septic tank

B. <u>Recommendations</u>

Although no direct evidence of hazardous contaminant migration was found during the Records Search, it is recommended that a limited follow-on field survey program (Phase II) be implemented to verify that contaminant migration is not a problem at Langley AFB. A preliminary scope of the recommended field survey program is given below:

1. Installation of shallow ground-water monitoring wells (6 to 10 feet in depth) in the vicinity of landfill Sites No. 10, 11, and 12, including two wells upgradient and three wells downgradient of the landfill sites. These landfills were selected because of their long-term past use and their proximity to Tabbs Creek.

Table 4
SUBJECTIVE RATING SUMMARY FOR LANGLEY AFB PAST LANDFILL SITES

Landfill Site[a]	Subjective Rating Criteria												Composite Priority Rating	% of Maximum Possible Rating
	1	2	3	4	5	6	7	8	9	10	11	12		
Site No. 1	1	1										3	5	11
Site No. 5	1	1				5						3	10	22
Site No. 7	1	1	1	1		5				1		3	13	29
Site No. 10	1	1	1		1	5						3	12	27
Site No. 11	1	1	1		1	5				1		3	13	29
Site No. 12	1	1	1		1	5			1	1		3	15	33
Site No. 13		1										3	4	9
Site No. 15	1	1										3	5	11
Site No. 17	1	1				5						3	10	22
Site No. 18	1	1				5						3	10	22
Site No. 22	1	1										3	5	11

[a]Refer to Figure 13 for the landfill locations.

Note: The composite rating indicates high priority for Sites 7, 10, 11, and 12 for limited follow-on field survey work.

2. Installation of shallow ground-water monitoring wells (6 to 10 feet depth) in the vicinity of landfill Site No. 7, including two wells upgradient and three wells downgradient of the landfill site. This landfill was selected because of its long-term past use and its proximity to Tide Mill Creek.

3. One-time collection of ground-water samples from the above wells for analysis including heavy metals[1], pesticides/herbicides[2], PCBs, total organic halogen, phenols, oil and grease, total organic carbon, pH, and specific conductance.

4. Installation of shallow ground-water monitoring wells (6 to 10 feet depth) at septic tank 7, including one well upgradient and three wells downgradient of the septic tank drainfield, and one-time collection of ground-water samples from the wells for pesticides/herbicides analysis.[2]

5. Installation of shallow ground-water monitoring wells (6 to 10 feet depth) at the old chemical leach pit area, including one well upgradient and three wells downgradient of the leach pit area, and one-time collection of ground-water samples from the wells for pesticides/herbicides analysis.[2]

6. Soil sampling at the out-of-service transformer storage area, including soil samples collected at two locations at the surface and at 3-foot depths for PCBs analysis.

---

[1]Heavy metals analyses should include total chromium, hexavalent chromium, cadmium, lead, mercury, selenium, and silver.

[2]Pesticides and herbicides analyses should include Endrin, Lindane, Methoxychlor, Toxaphene, Chlordane, Dieldrin, DDT, 2, 4-D and 2,4,5-TP Silvex.

7. Soil sampling at the pesticide/herbicide storage area behind the Entomology Building, including samples collected at two locations at the surface and at 3-foot depths for pesticides/herbicides analysis.[2]

8. Soil core samples at the suspected fuel-saturated areas, Sites No. 3, 4, 16, and 21, including two 6-foot cores at each site, and collection of soil samples at 1-foot depths from each core for volatile hydrocarbon analysis.

9. Implementation of a limited sampling program in Tabbs Creek and Tide Mill Creek including collection of sediment and water column samples from three locations in each creek (upstream, downstream, and adjacent to the landfill sites). Analyses of sediment and water samples should include heavy metals[1], pesticides/herbicides[2], total organic halogen, phenols, oil and grease, pH, and total coliform bacteria.

10. Geophysical logging and sampling of a deep water supply well to determine water quality conditions in the aquifer underlying Langley AFB. This task is contingent upon confirmation of the existence of deep water supply wells at Langley AFB. The interviews indicated that one or more old abandoned wells may be present in the LTA area.

In the event that contaminant migration is identified, a more extensive field survey program should be implemented to determine the extent of the contaminant migration.

---

[1]Heavy metals analyses should include total chromium, hexavalent chromium, cadmium, lead, mercury, selenium, and silver.

[2]Pesticides and herbicides analyses should include Endrin, Lindane, Methoxychlor, Toxaphene, Chlordane, Dieldrin, DDT, 2, 4-D and 2,4,5-TP Silvex.

Details of the program outlined above, including the exact location of sampling points, should be finalized as part of the Phase II program.

As a point of information, it is estimated that the total cost for the limited Phase II program should be less than $50,000.

IV. CAPE CHARLES AIR FORCE STATION

IV. CAPE CHARLES AIR FORCE STATION

A. Location

Cape Charles Air Force Station is supported by Langley AFB and includes approximately 166 acres located across Chesapeake Bay on the eastern shore. Elevations at Cape Charles Air Force Station are generally between 8 and 12 feet above mean sea level (msl).

B. History

Cape Charles Air Force Station was previously used as a coastal artillary installation by the Army during World War II. No unexploded ordnance (UXO) has been found on the site; however, the interviews indicated that UXO has been found (infrequently) by fishermen in the off-shore waters.

C. Water Supply and Wastewater Treatment

The water supply is obtained from three wells approximately 80 feet deep. The water table aquifer contains a thick lens of freshwater build-up from local rainfall due to the presence of a thick beach and dense sand stratum and the lack of clay and silt. Sanitary wastewater is collected and treated in a Davco activated sludge package plant (approximately 10,000 gallons per day). The treated wastewater is discharged to a small half-acre evaporation/percolation pond for final disposal.

D. Solid Waste

Soil waste at Cape Charles Air Force Station is currently collected and hauled offsite by a contractor to a county landfill. There was an active landfill in operation from about 1953 until the mid-1960's which received all solid

wastes generated at Cape Charles Air Force Station. There was no indication from the records or from the interviews that large quantities of hazardous wastes were disposed of in this landfill.

E. Cape Charles GATR Site

There were, until recently, two out-of-service transformers containing PCBs in protective storage at the Cape Charles Ground Air Transmitter Receiver (GATR) site, a small 7 acre site located about 5 miles from Cape Charles Air Force Station. These transformers were properly labeled and stored inside a building on a concrete pad. The transformers were recently transferred to Langley AFB for protective storage.

F. Conclusions and Recommendations

No indication was found from the records or from the interviews of potential contaminant migration from Cape Charles Air Force Station. Therefore, no follow-on Phase II field survey work is recommended.

FIGURES

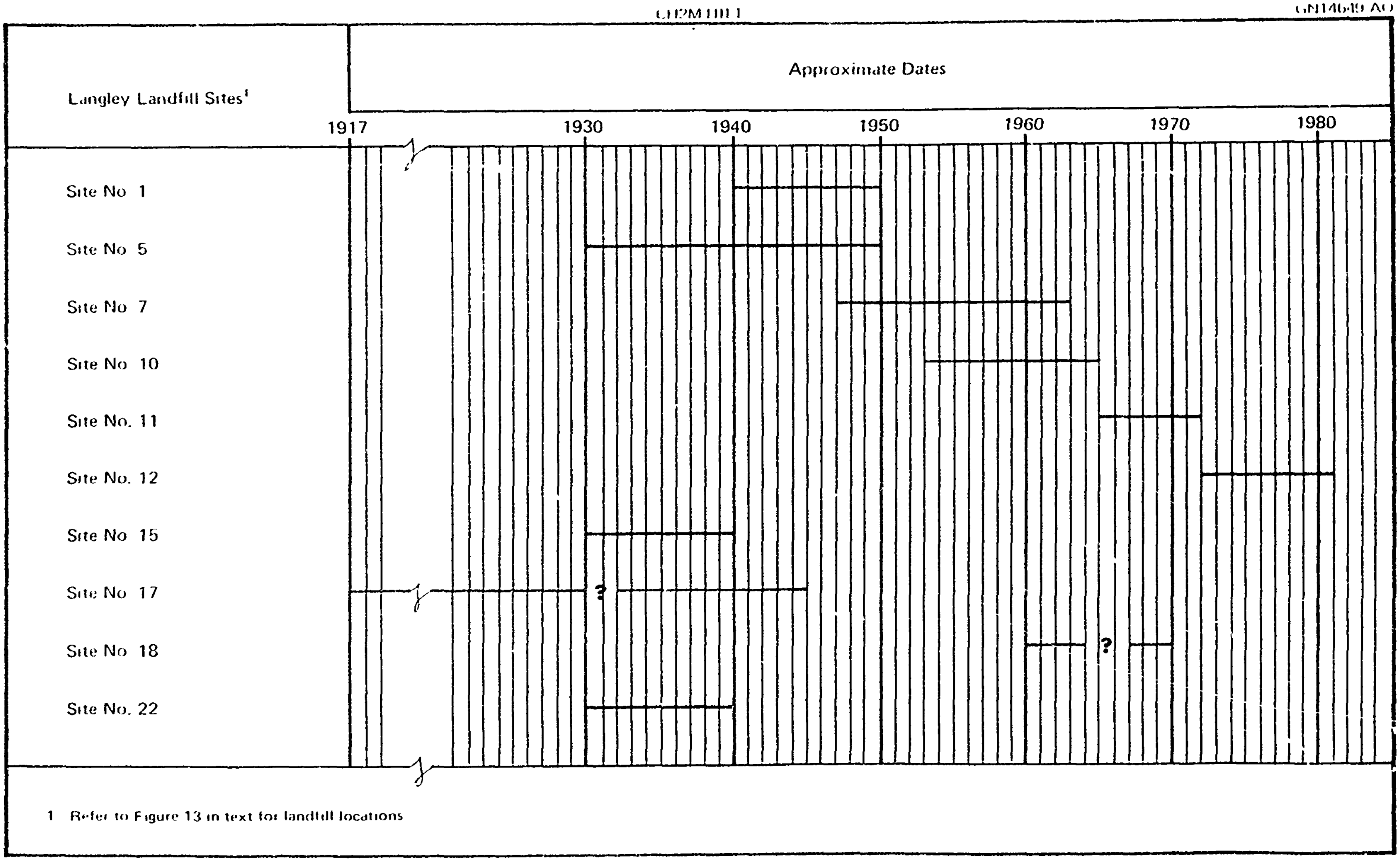
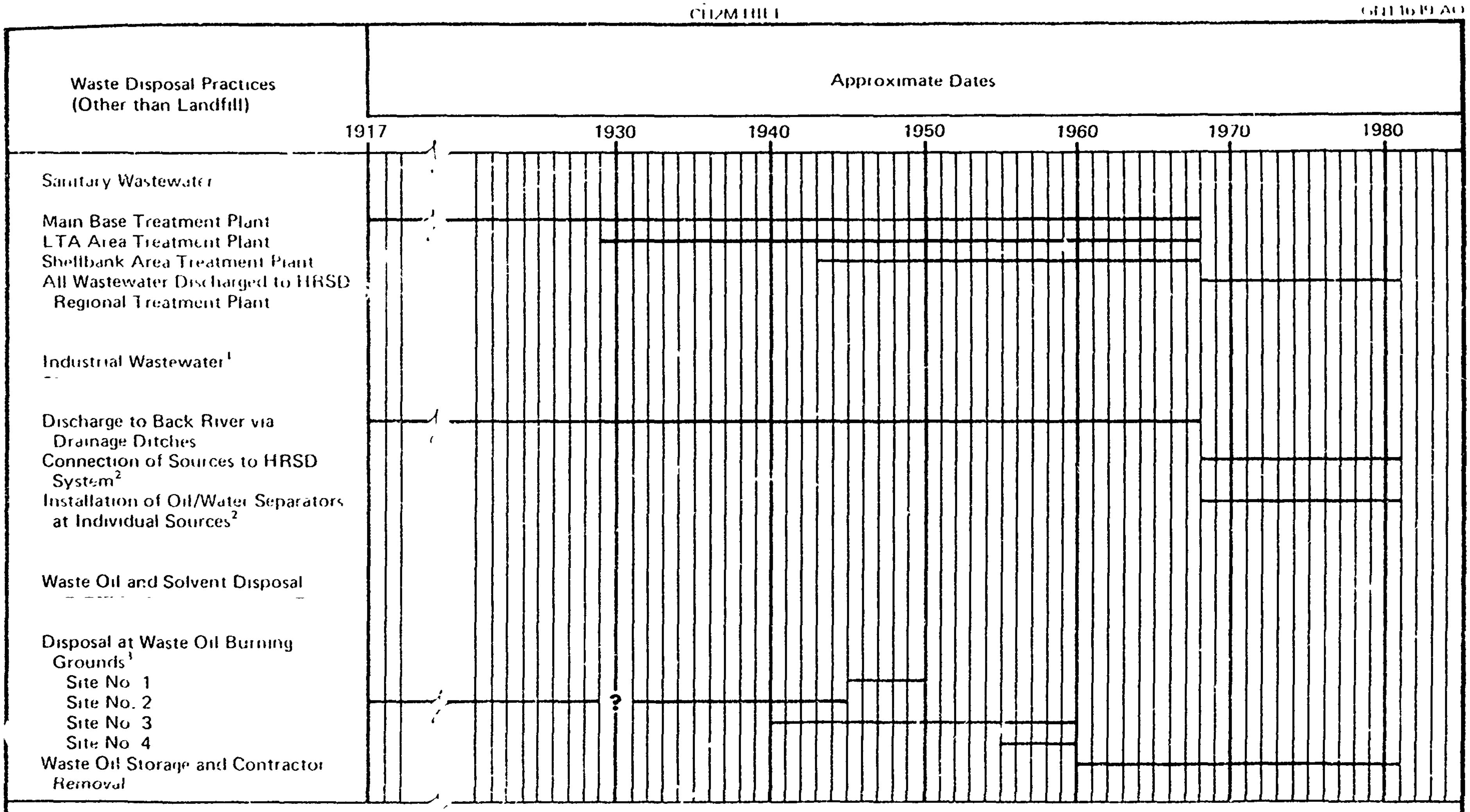


FIGURE 1. Historical summary of landfill activities at Langley Air Force Base.



1 Preliminary washdown and drainage from aircraft and vehicle maintenance areas, cooling tower bleed off, and swimming pool filter back wash
2 Done gradually over indicated time period
3 Refer to Figure 15 in text for waste oil burning ground locations

FIGURE 2. Historical summary of waste disposal practices other than landfills at Langley Air Force Base.

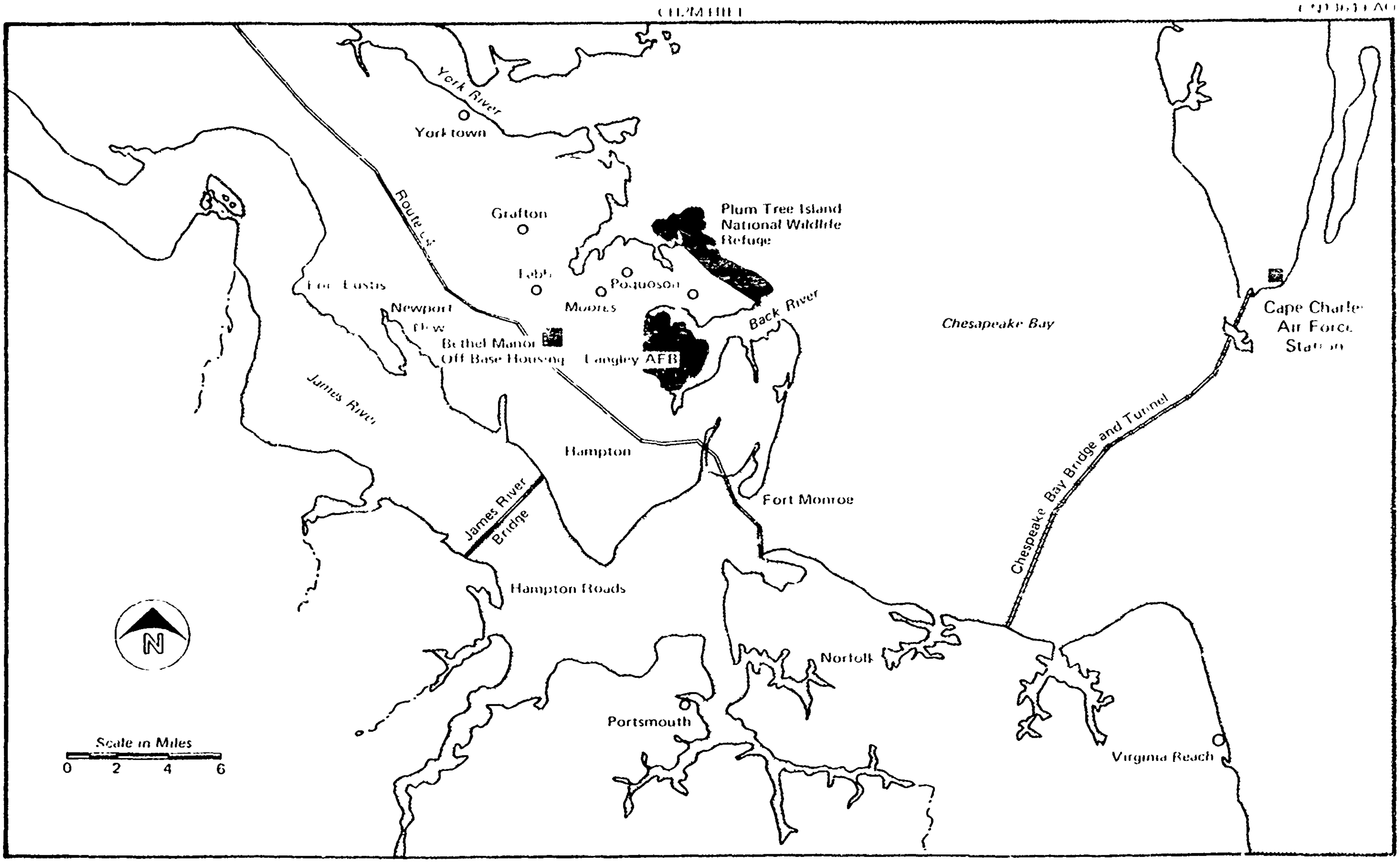


FIGURE 3. Location map.

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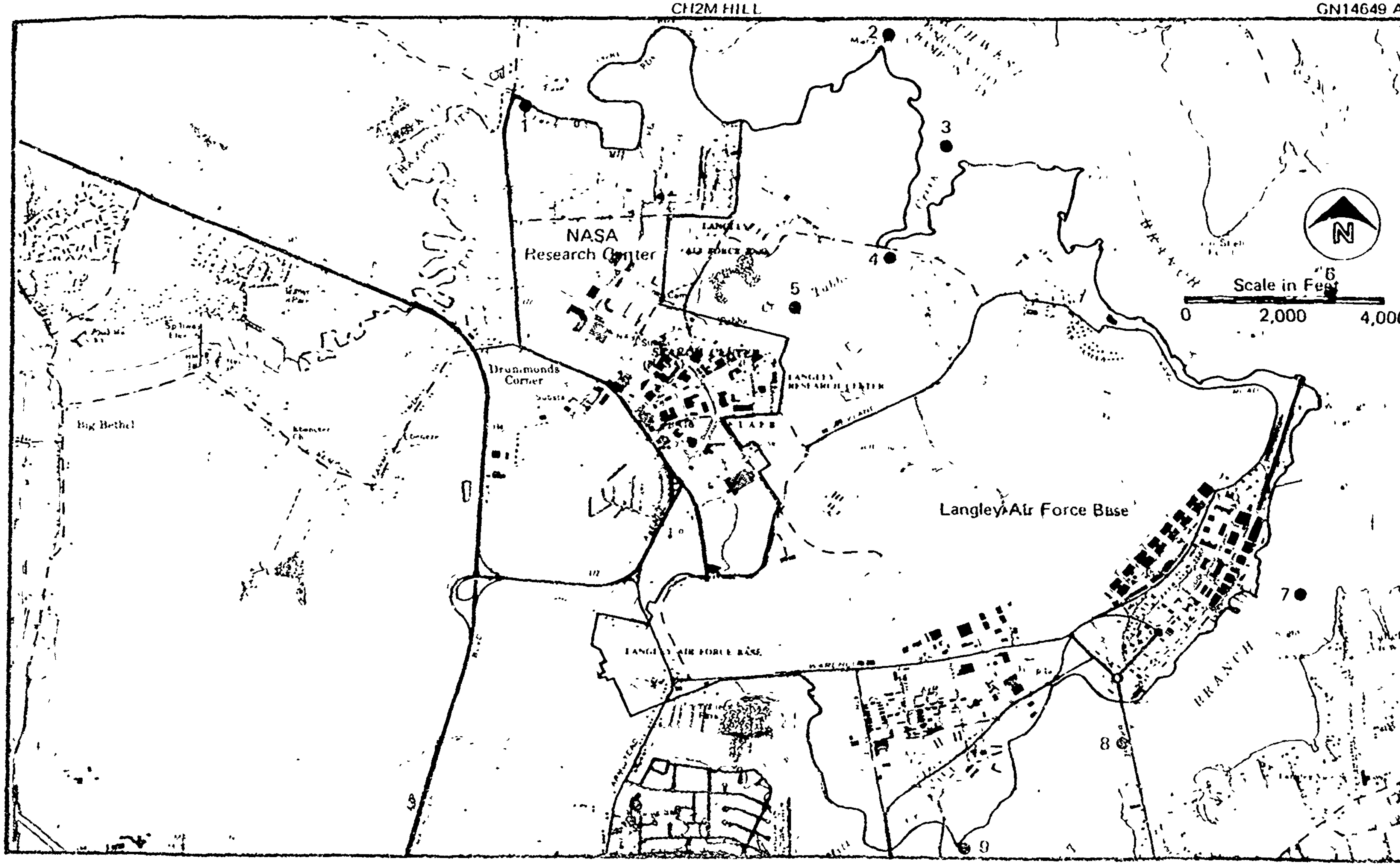

FIGURE 4. Water quality sampling stations Virginia Water Control Board surveillance, November 16, 1979.

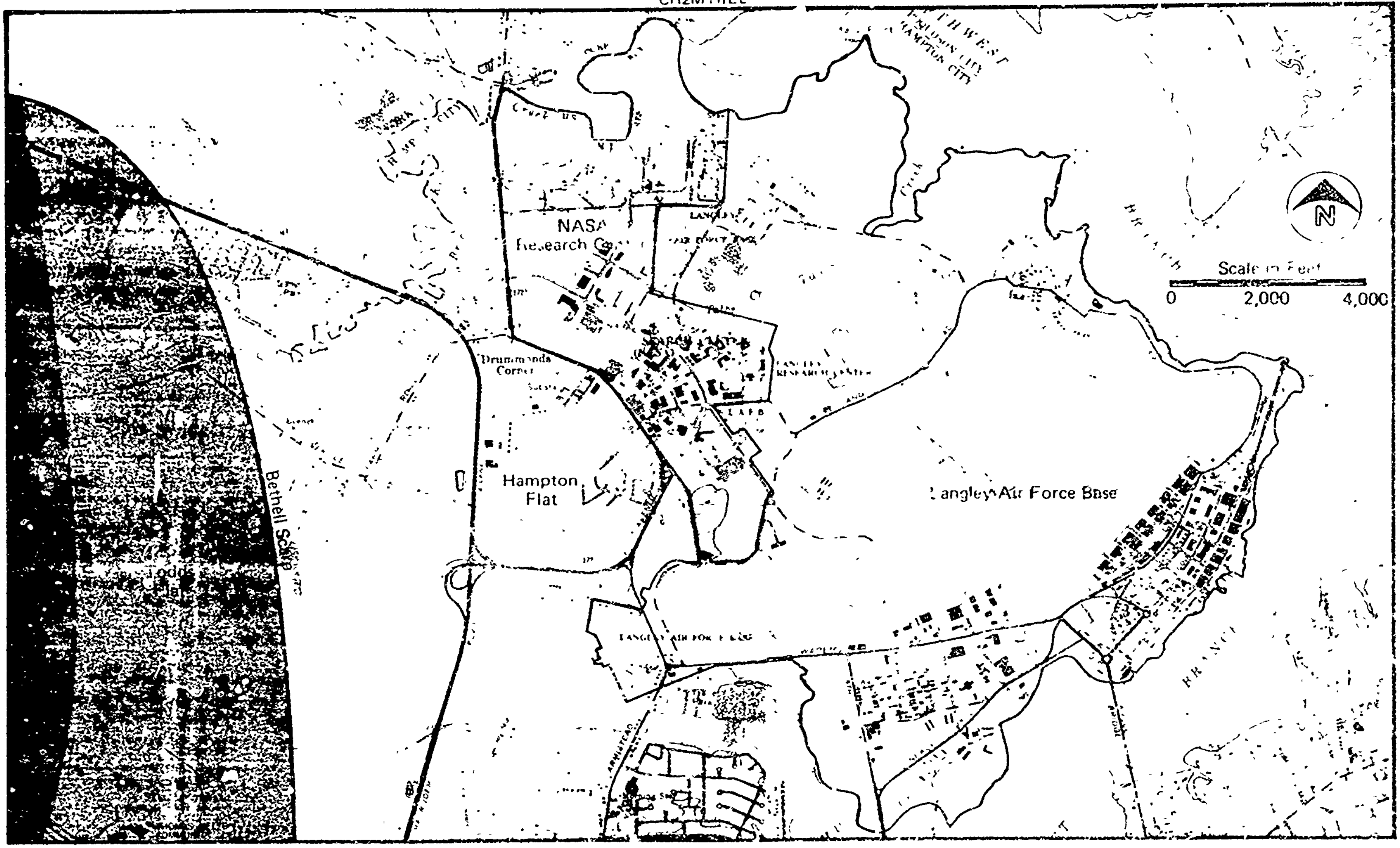

FIGURE 5. Physiographic map of Langley Air Force Base area (after Johnson)

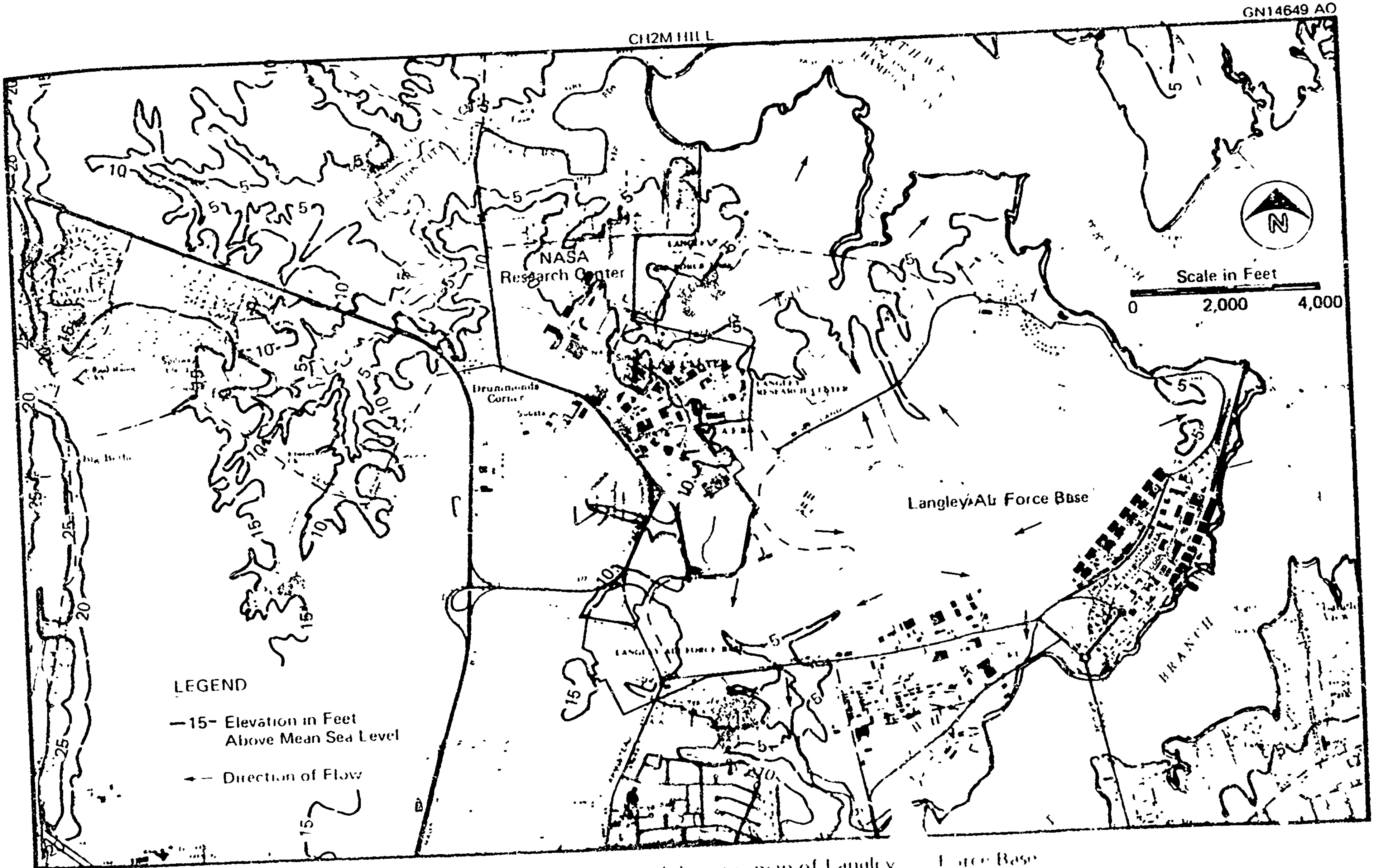

FIGURE 6. Topographic and drainage map of Langley Air Force Base

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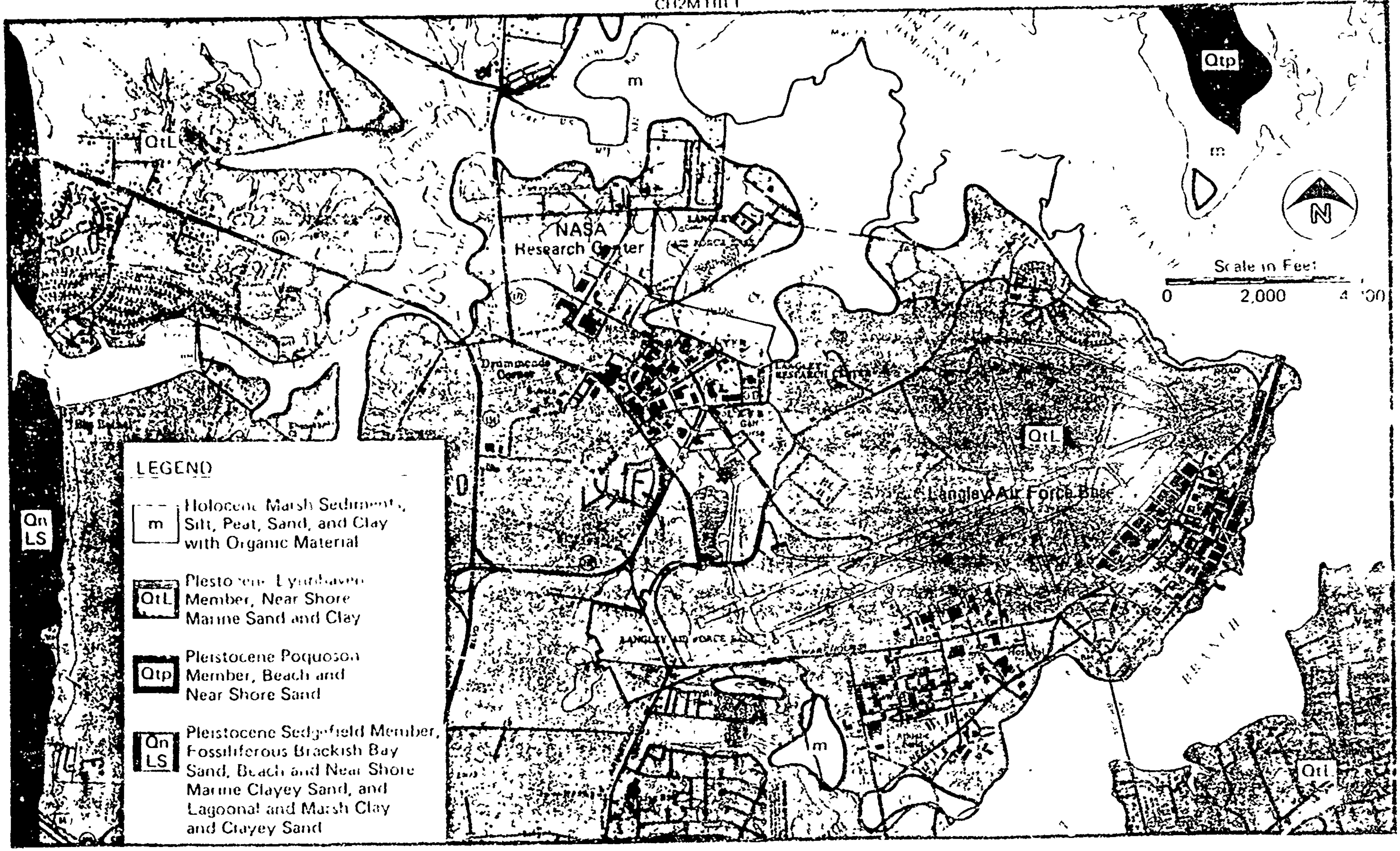

FIGURE 7. Geologic map of Langley Air Force Base area (after Johnson).

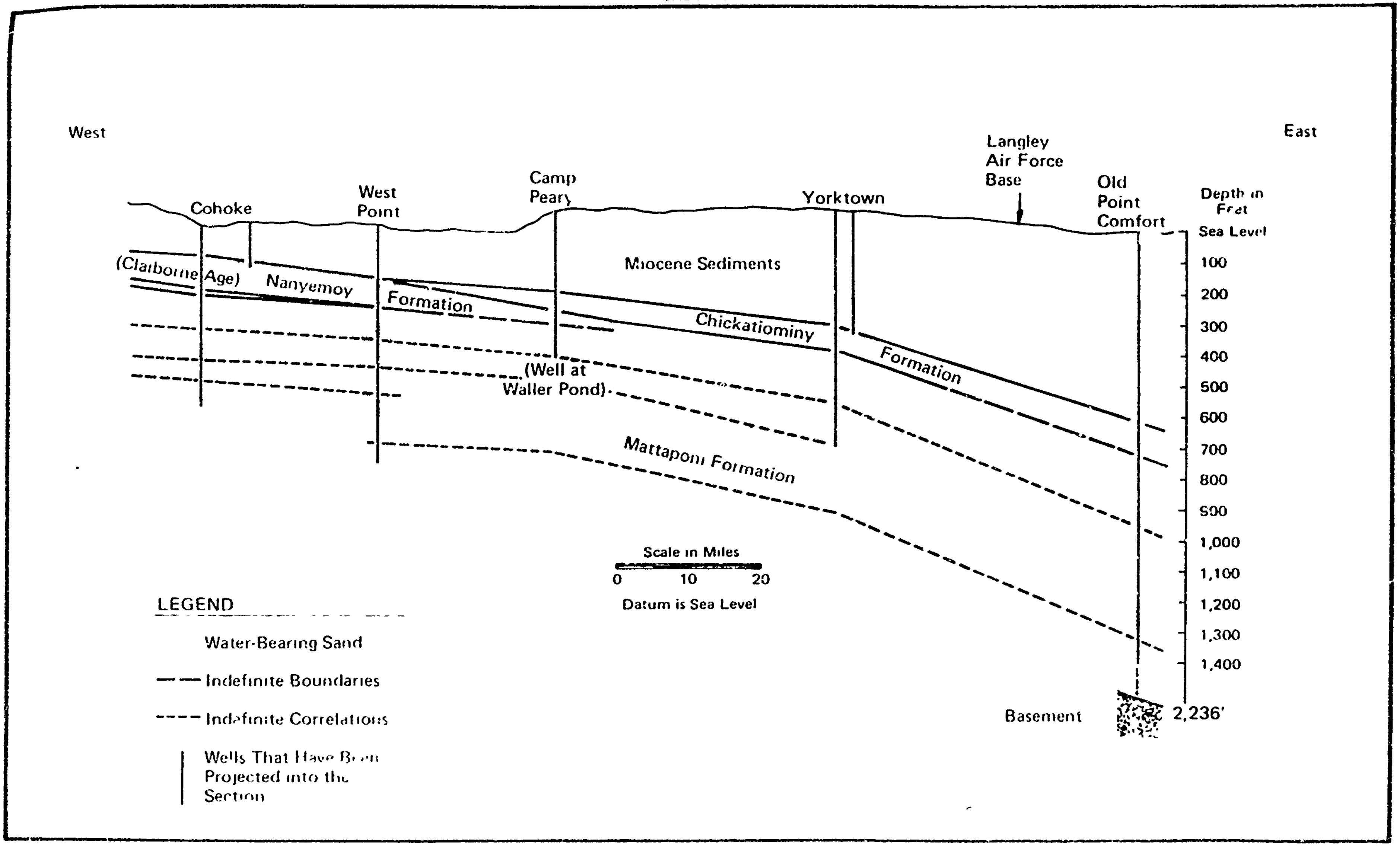

FIGURE 8. Geologic cross section of Langley Air Force Base area (east west trend) (after Cedarstrom).

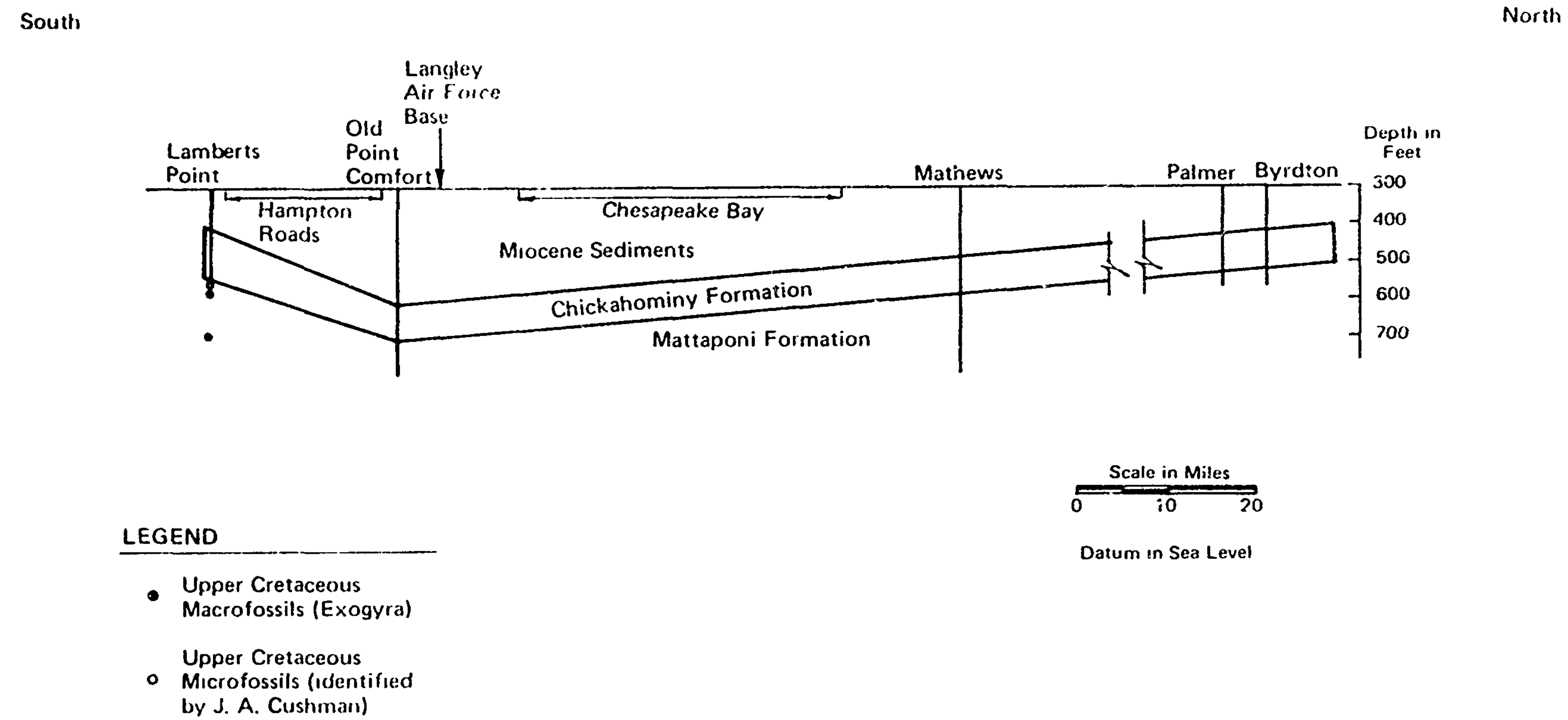

FIGURE 9. Geologic cross section of Langley Air Force Base area (north-south trend) (after Cedarstrom).

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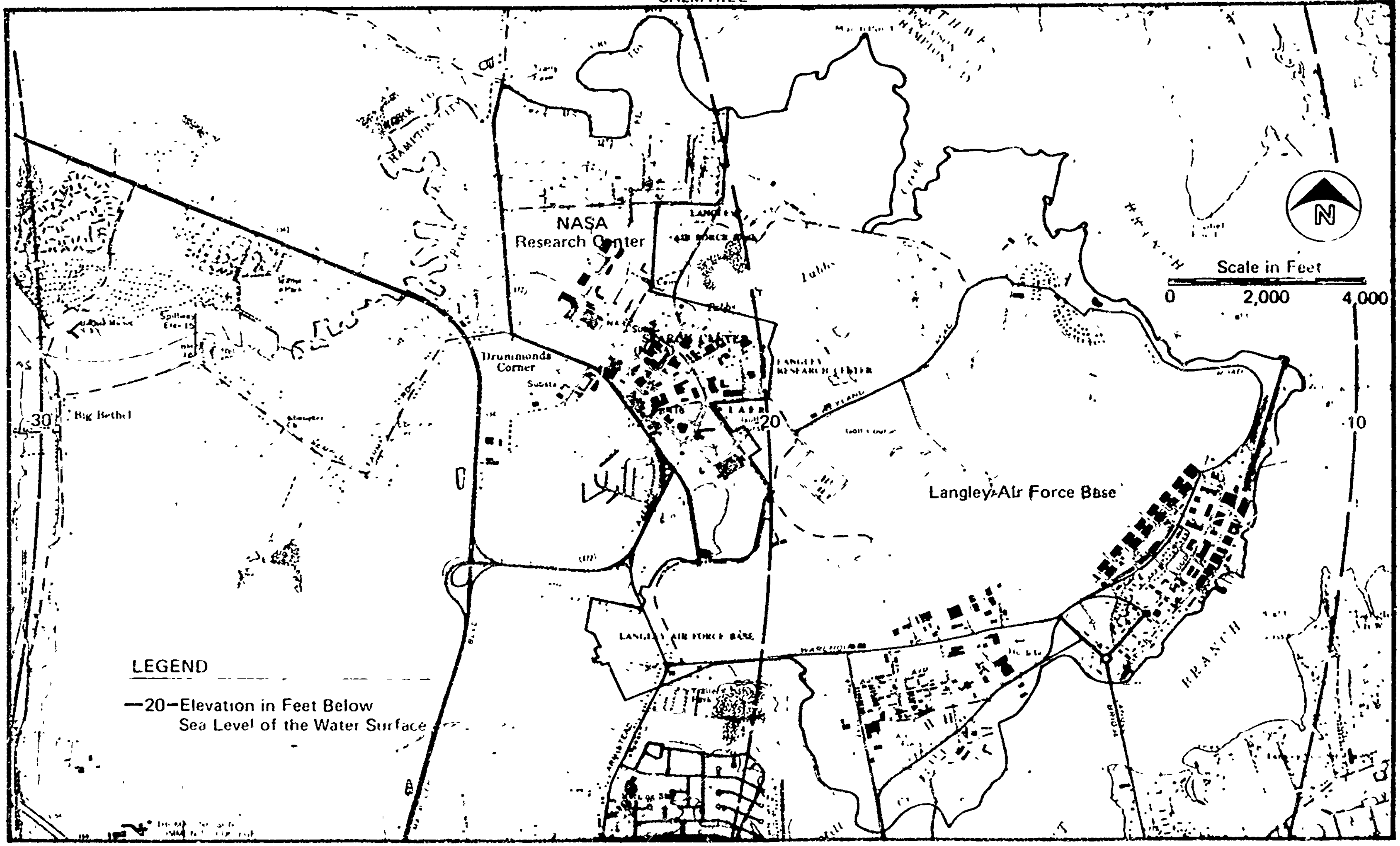

FIGURE 10. Potentiometric surface of the principal aquifer system of Langley Air Force Base area, December 1972 (after Virginia Water Control Board).

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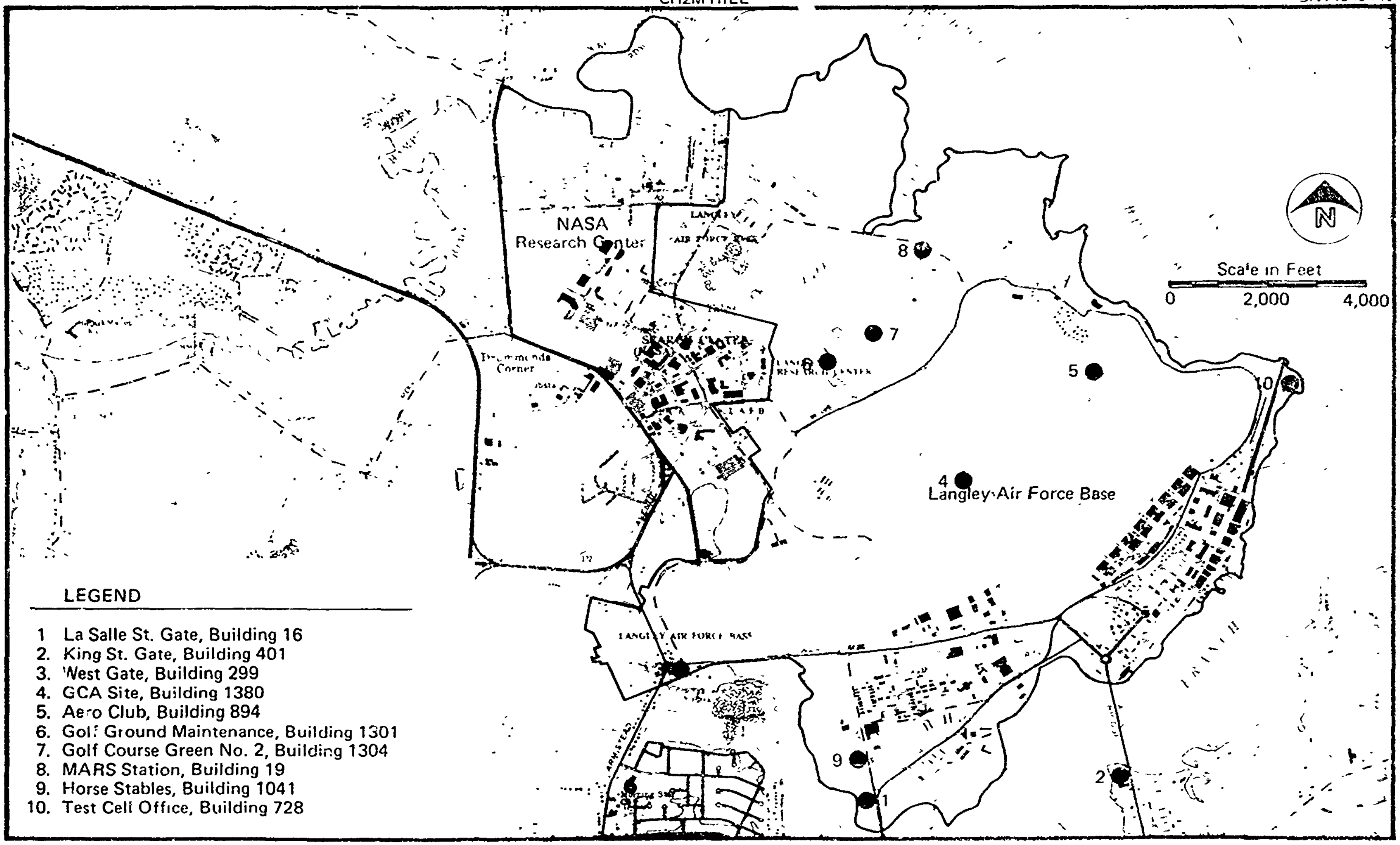

FIGURE 11. Location of septic tanks at Langley Air Force Base.

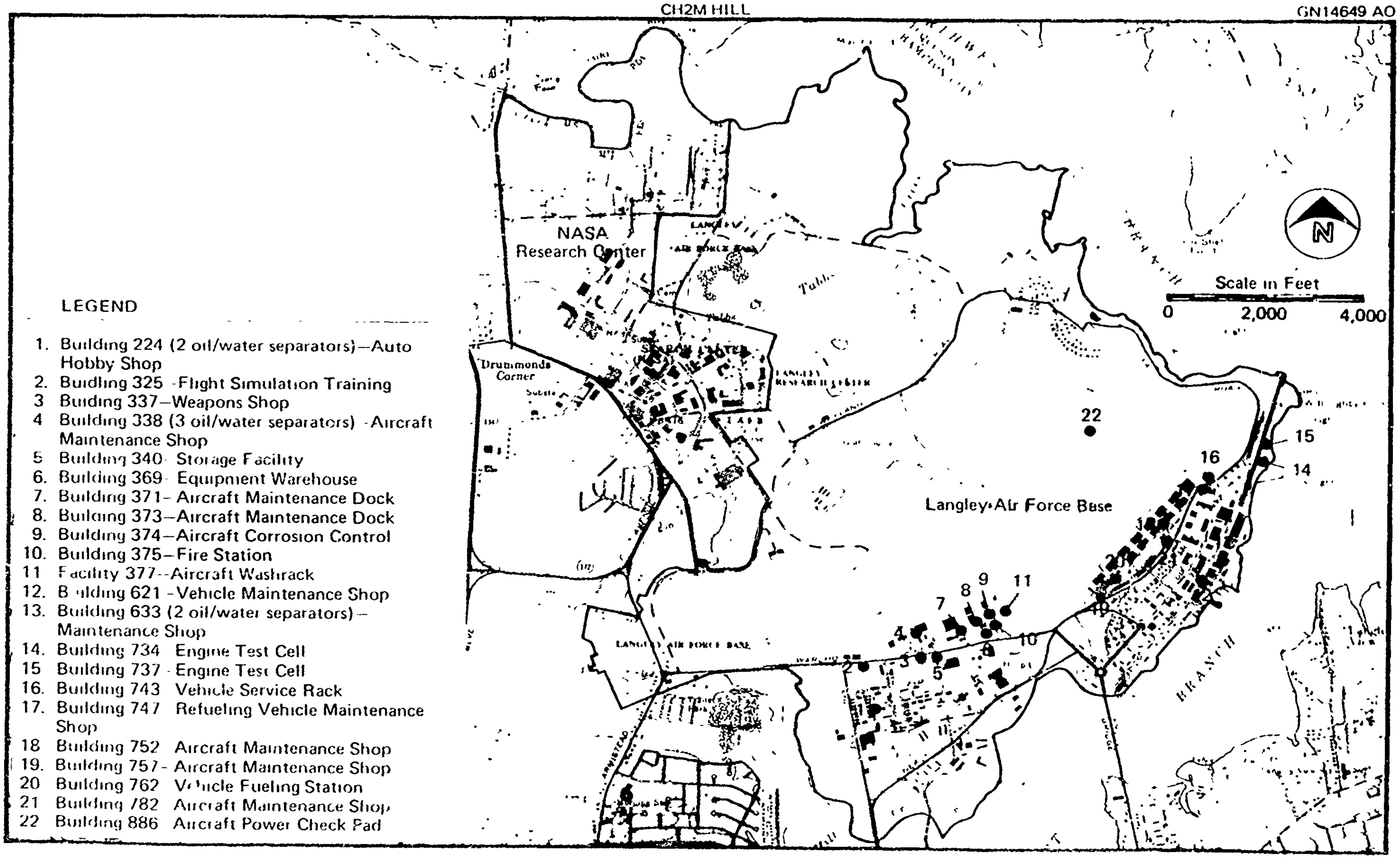

FIGURE 12. Location of oil/water separators at Langley Air Force Base.

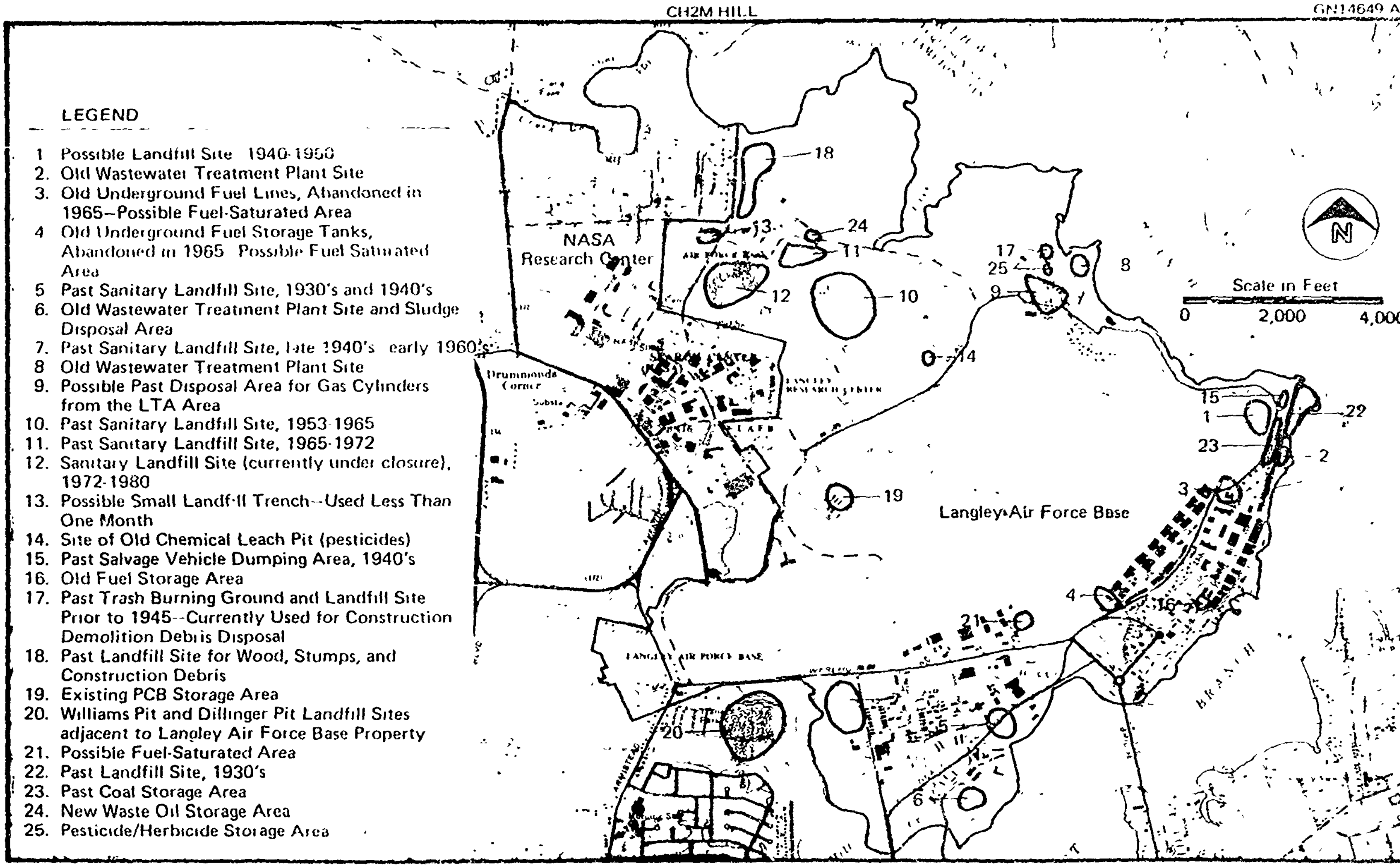

FIGURE 13. Location map of possible contaminated areas at or adjacent to Langley Air Force Base.

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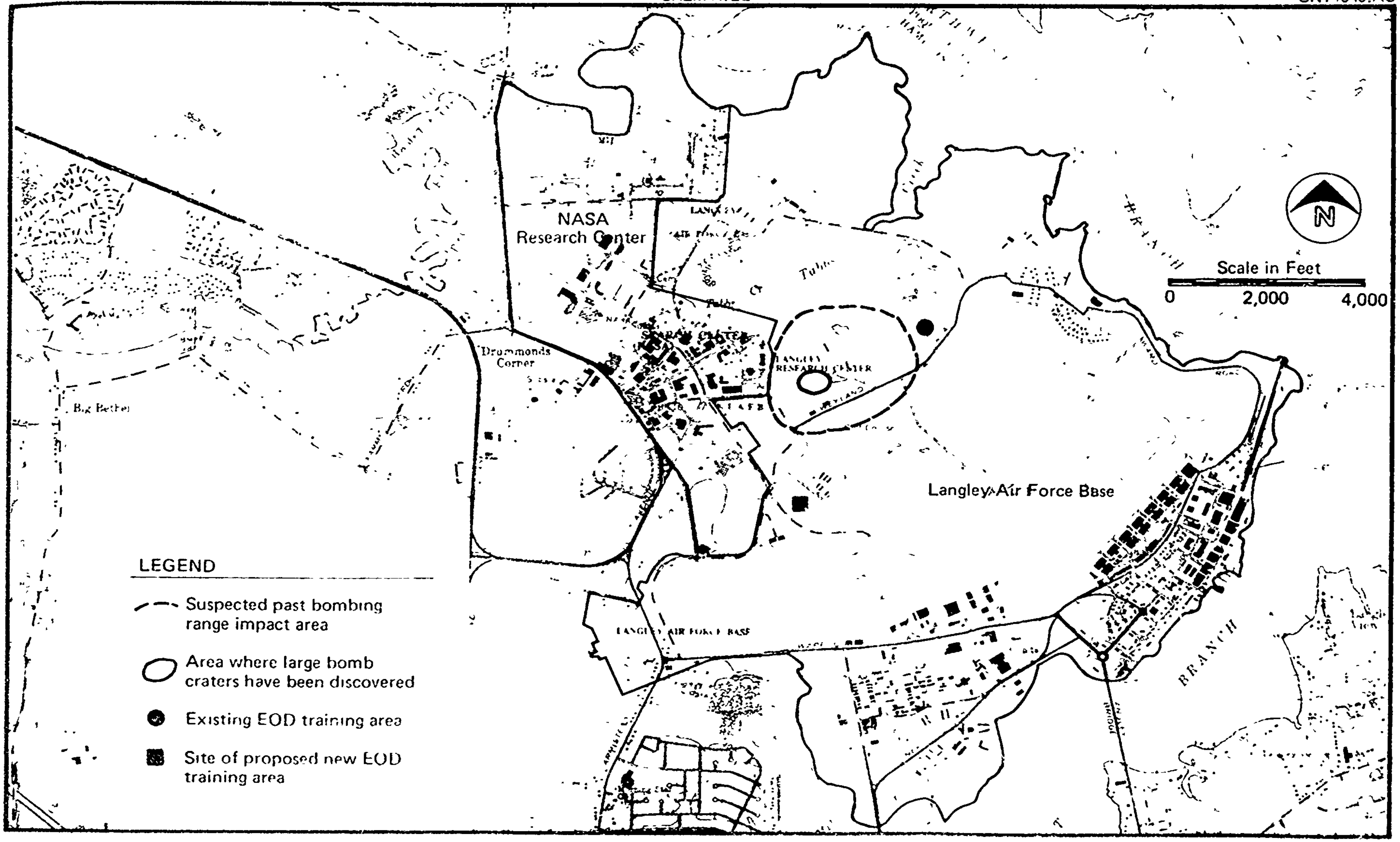

FIGURE 14. EOD training areas and suspected past bombing impact areas at Langley Air Force Base.

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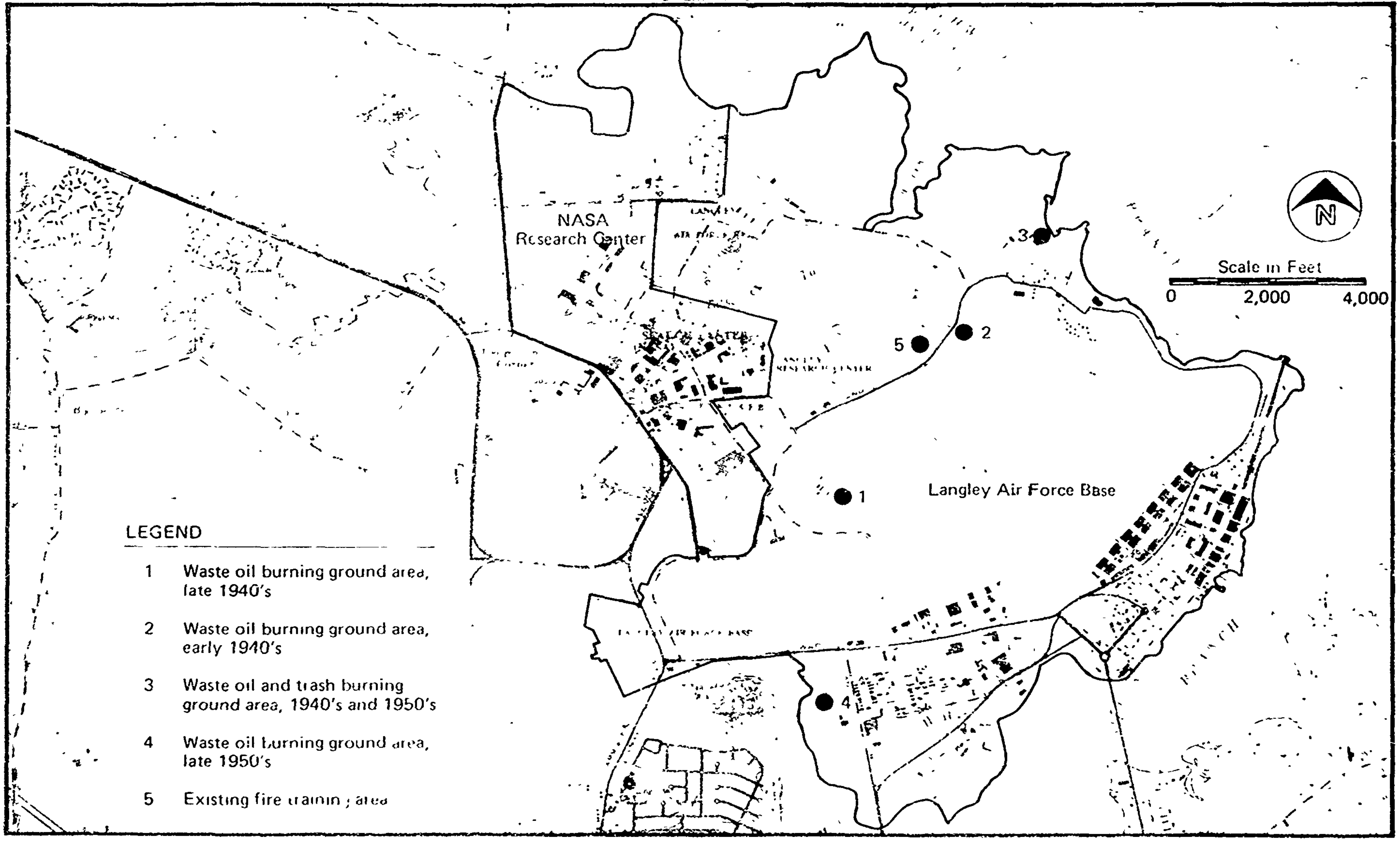

FIGURE 15. Past burning ground areas at Langley Air Force Base.

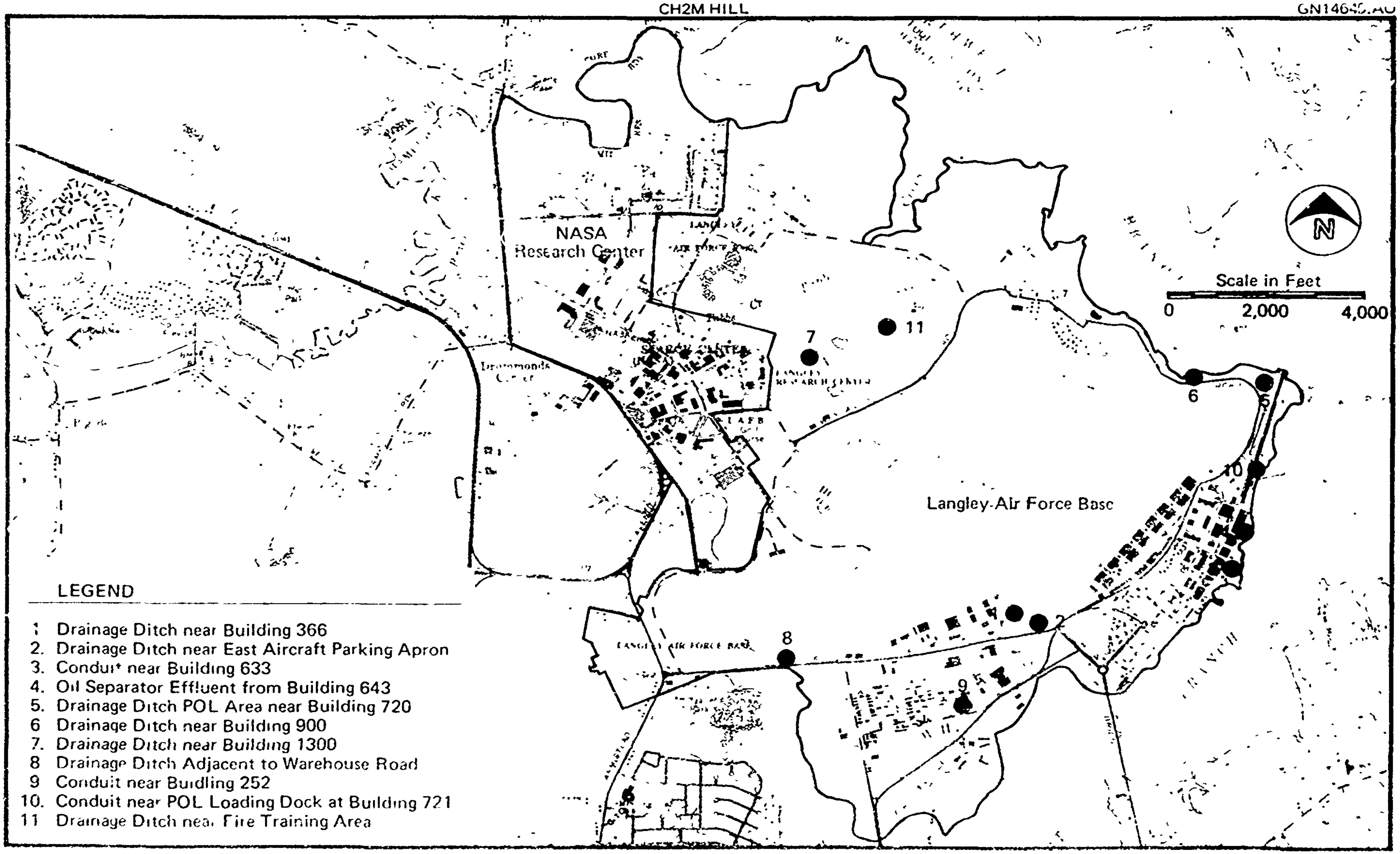

FIGURE 16. Water quality sampling stations at Langley Air Force Base

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REFERENCES

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30. Letter dated November 16, 1979 from Langley AFB Civil Engineer to the Virginia State Water Control Board. Tidewater Regional Office.

31. Virginia State Water Control Board Memorandum dated November 14, 1979. Re: "Langley AFB Sanitary Landfill."

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44. Maintenance Operating Instruction 136-8 "Operation of Explosive Ordnance Disposal Proficiency Training Range." June 20, 1980.

45. "Environmental Pollution Surveillance and Compliance Monitoring Plan,", LAFB Regulation 19-7. October 15, 1977.

46. Based on discussions with Capt. Eserick, Langley AFB Judge Advocate Office.

Appendix A

PHOTOGRAPHS OF
LANGLEY AFB

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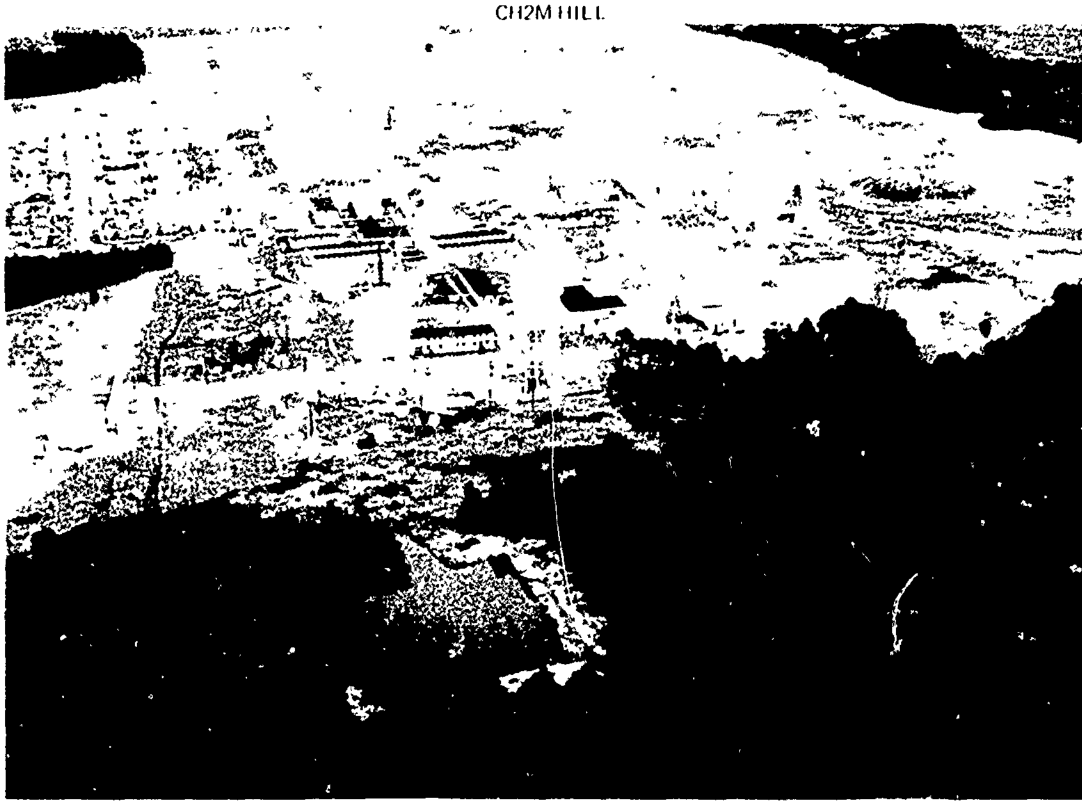

FIGURE A-1. Cape Charles Radar Station (with evaporation/percolation pond for disposal of treated sanitary wastewater in foreground).

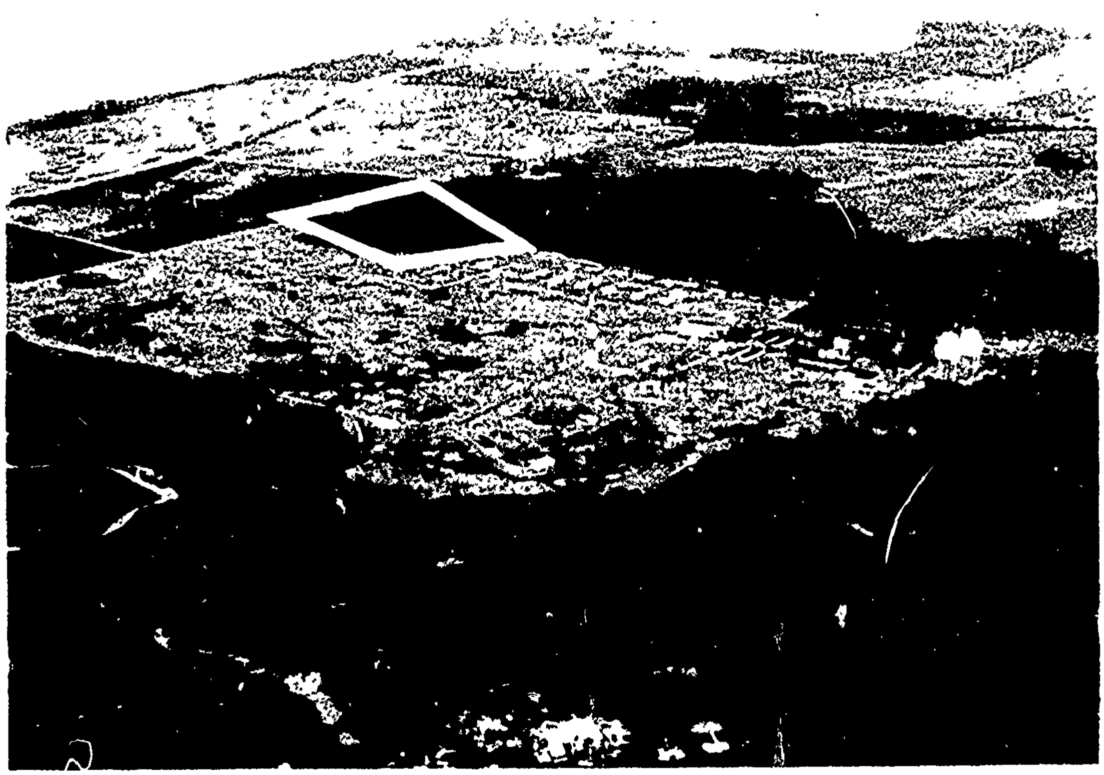

FIGURE A-2. Cape Charles Radar Station showing approximate location of past sanitary landfill.

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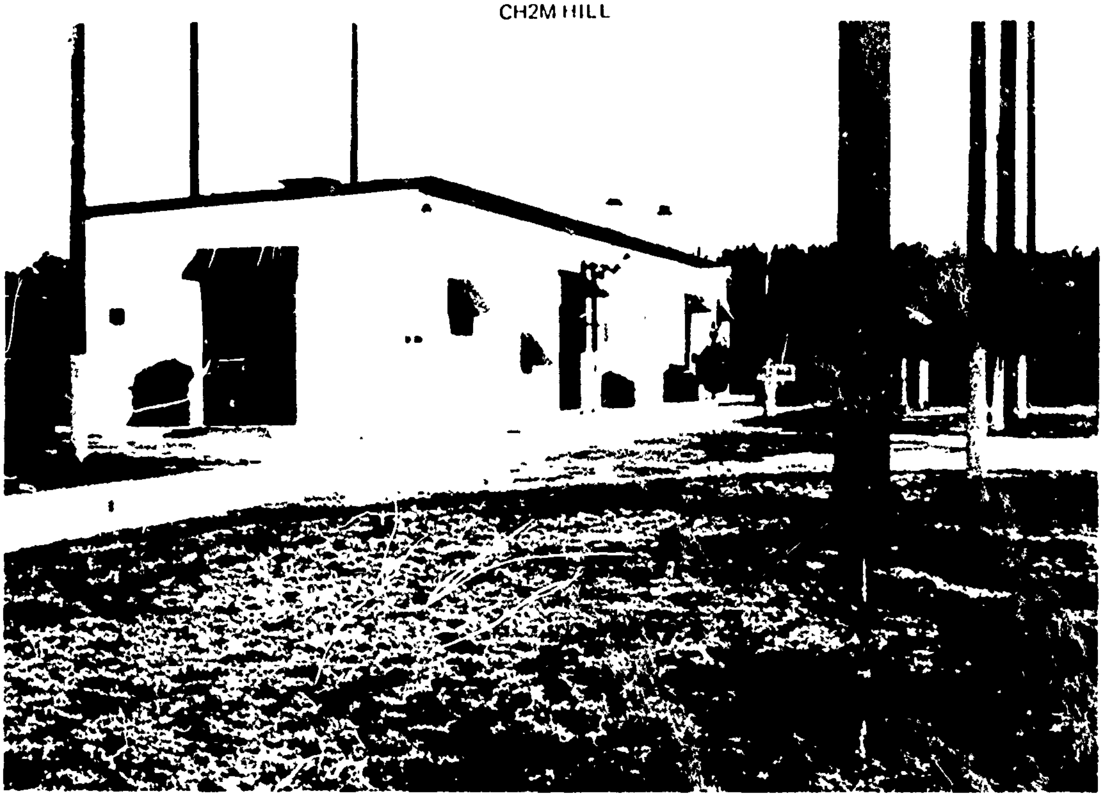

FIGURE A-3. Cape Charles GATR Station.

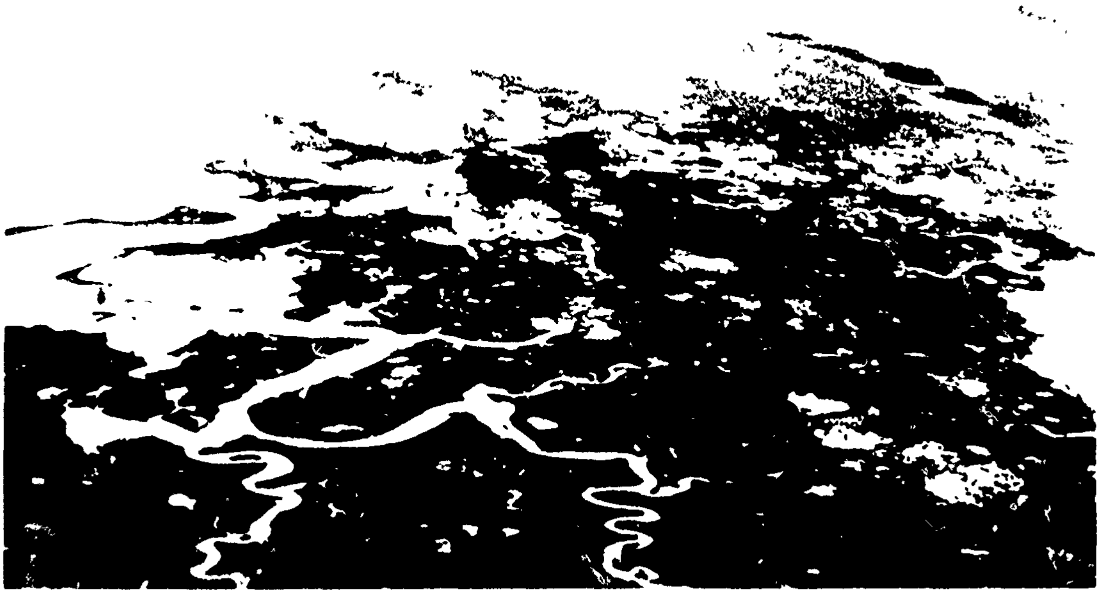

FIGURE A-4. Plum Tree Island area—former bombing range.

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FIGURE A-5. Plum Tree Island area—low-altitude photo showing old bomb craters.

FIGURE A-6. Plum Tree Island area.

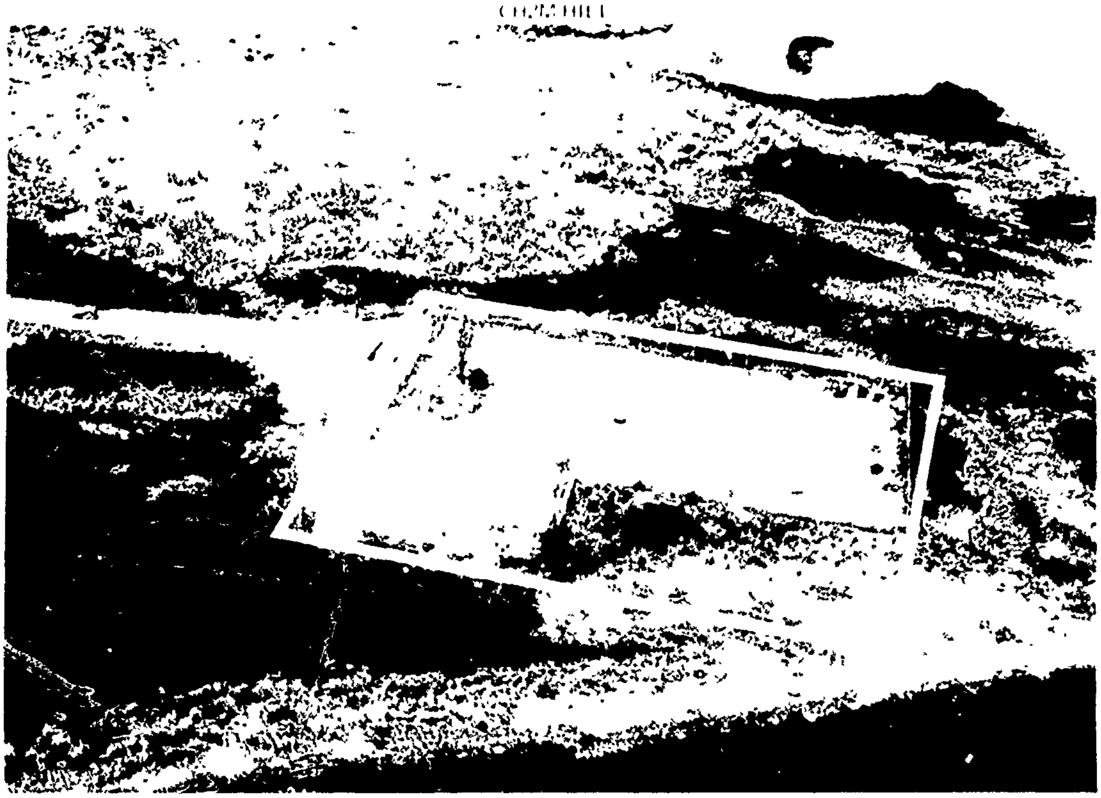

FIGURE A-7. Old wastewater treatment plant site at Langley Air Force Base Lighter Than Air (LTA) area (Site No. 8).

FIGURE A-8. Lighter Than Air area showing approximate locations of suspected old gas cylinder burial area (Site No. 9) and old trash burning ground (Site No 17)

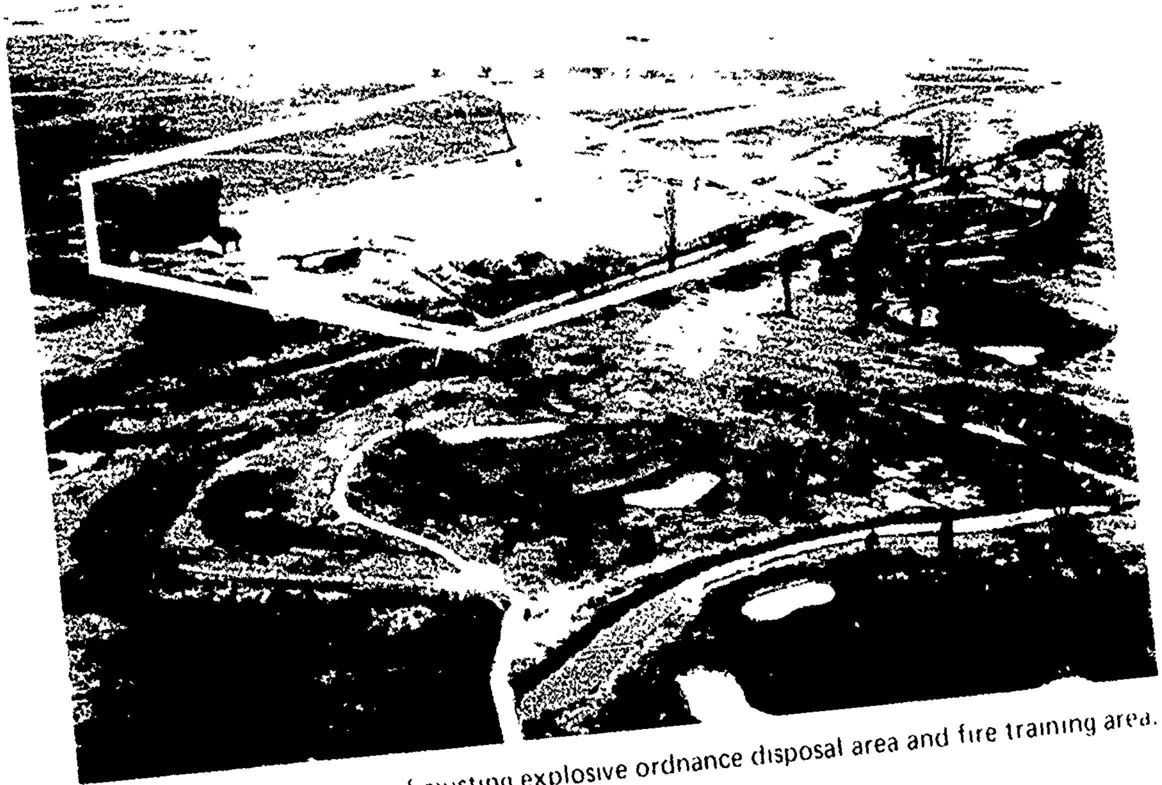

FIGURE A-9. Location of existing explosive ordnance disposal area and fire training area.

FIGURE A-10. Approximate location of old landfill Site No. 10 (existing golf course area).

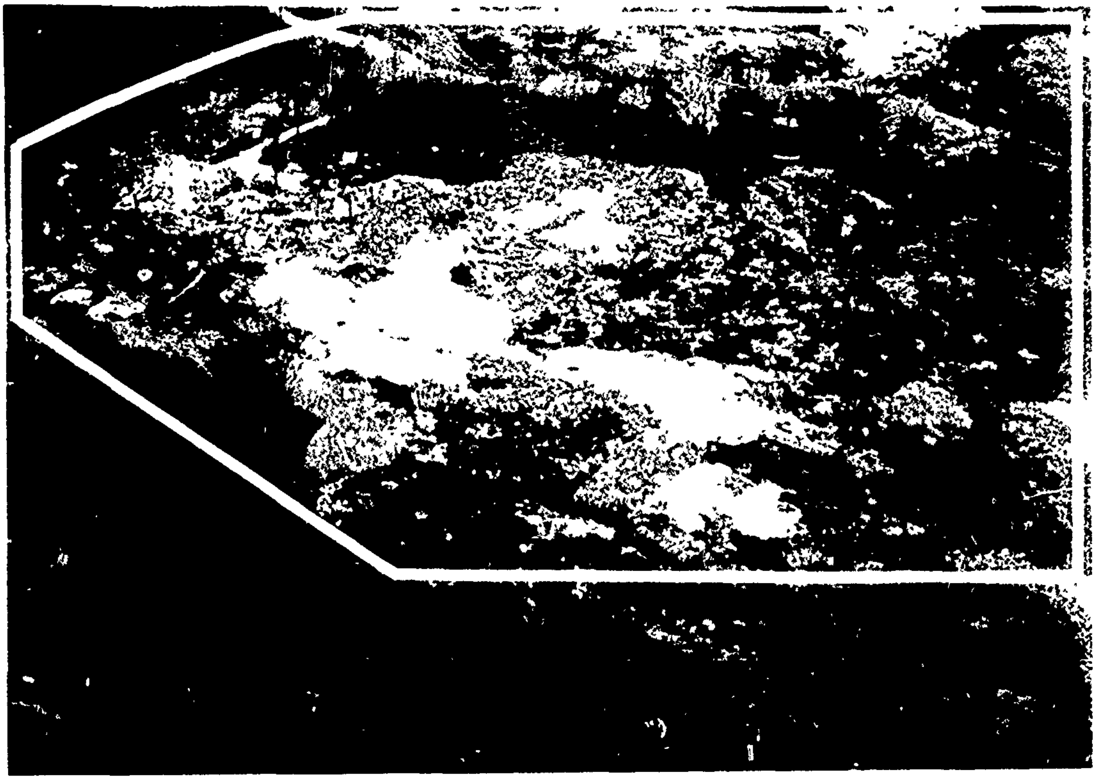

FIGURE A-11. Latest landfill site in the process of closure (Site No. 12).

FIGURE A-12. Latest landfill site in the process of closure (Site No. 12).

FIGURE A-13. Approximate locations of old landfill (Sites No. 11 and No. 12).

FIGURE A-15. Location of old landfill area (Site No 18).

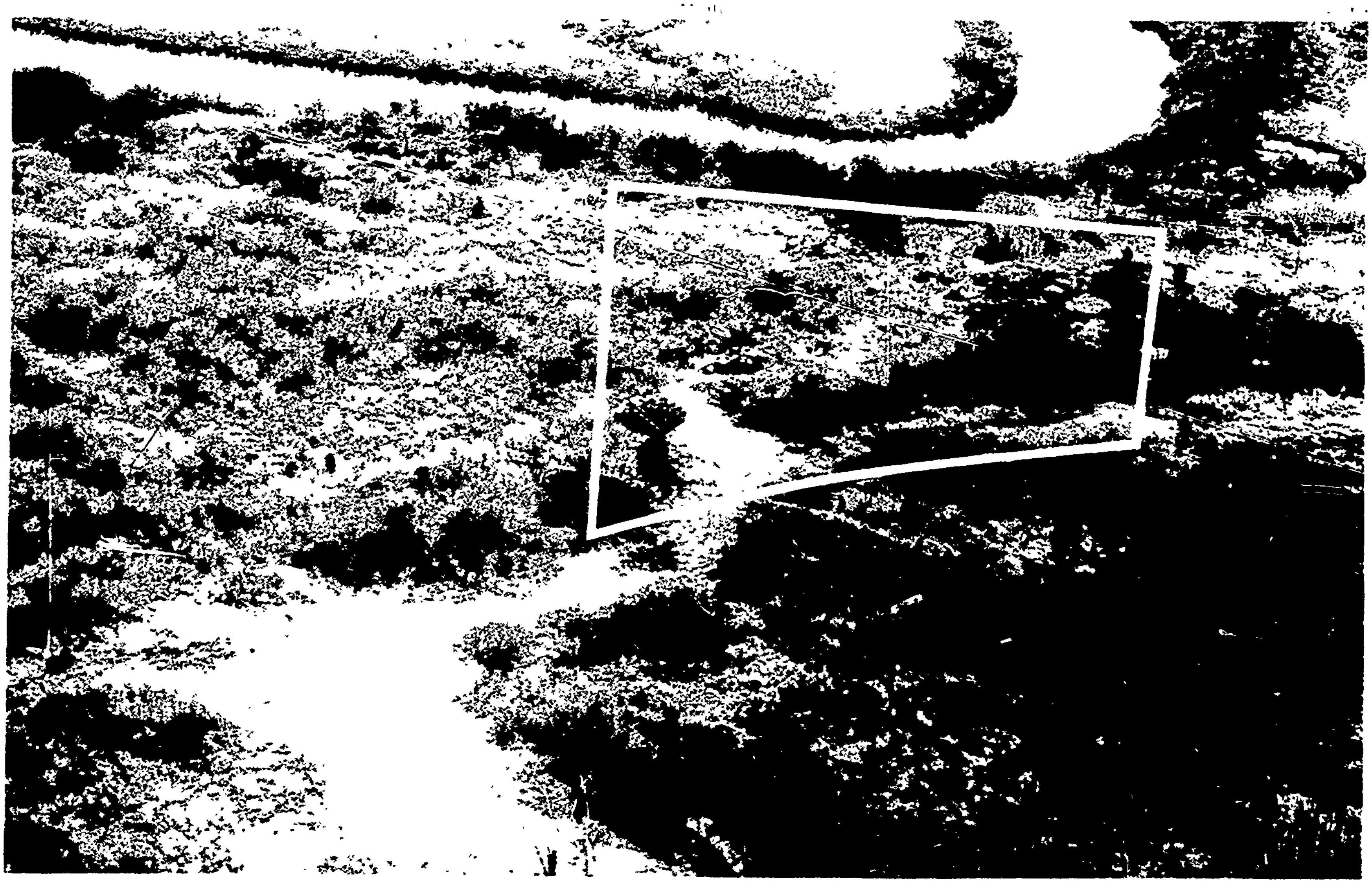

FIGURE A-14. Location of unauthorized storage of old empty drums discovered during the helicopter overflight

FIGURE A-16. Approximate location of suspected old landfill area (Site No. 1) and old vehicle dumping area (Site No. 15).

FIGURE A-17. Location of old underground fuel lines possible oil saturated area.

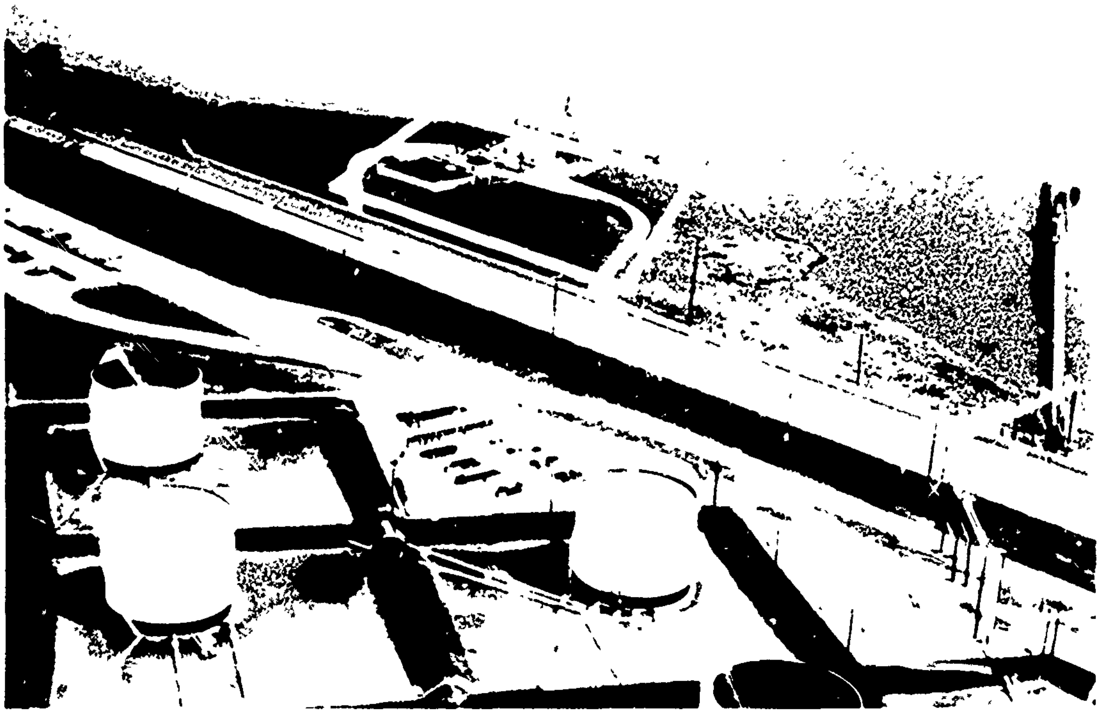

FIGURE A-18. Location of old wastewater treatment plant at the Main Base Area (Site No 2).

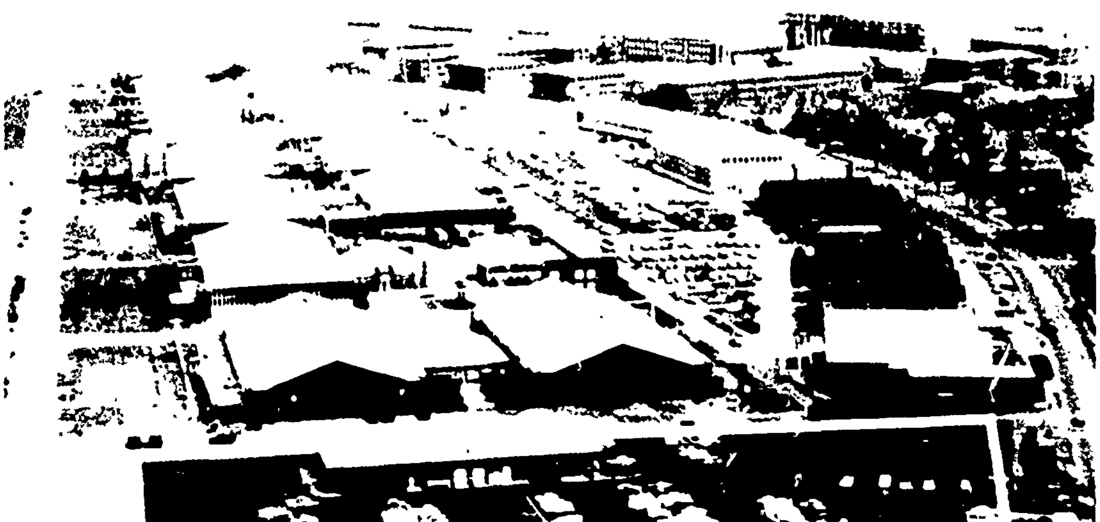

FIGURE A 19. Location of old underground oil storage tanks possible oil saturated area

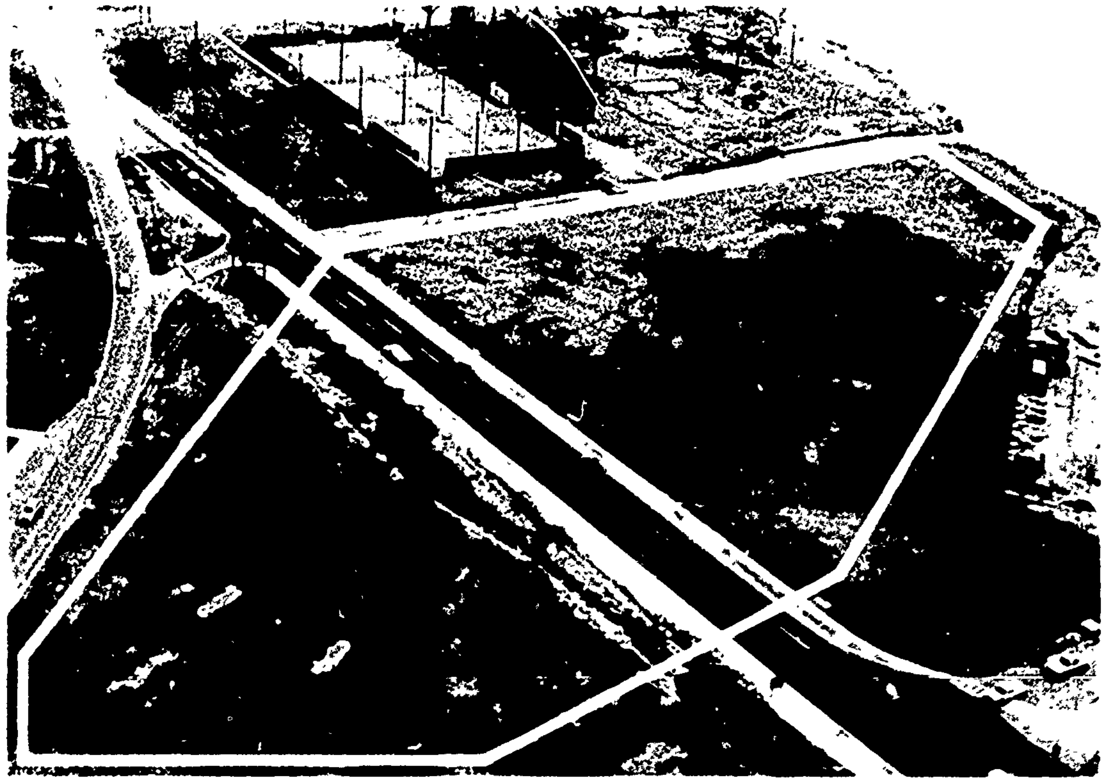

FIGURE A-20. Approximate location of old landfill (Site No. 5) located in the Shellbank area.

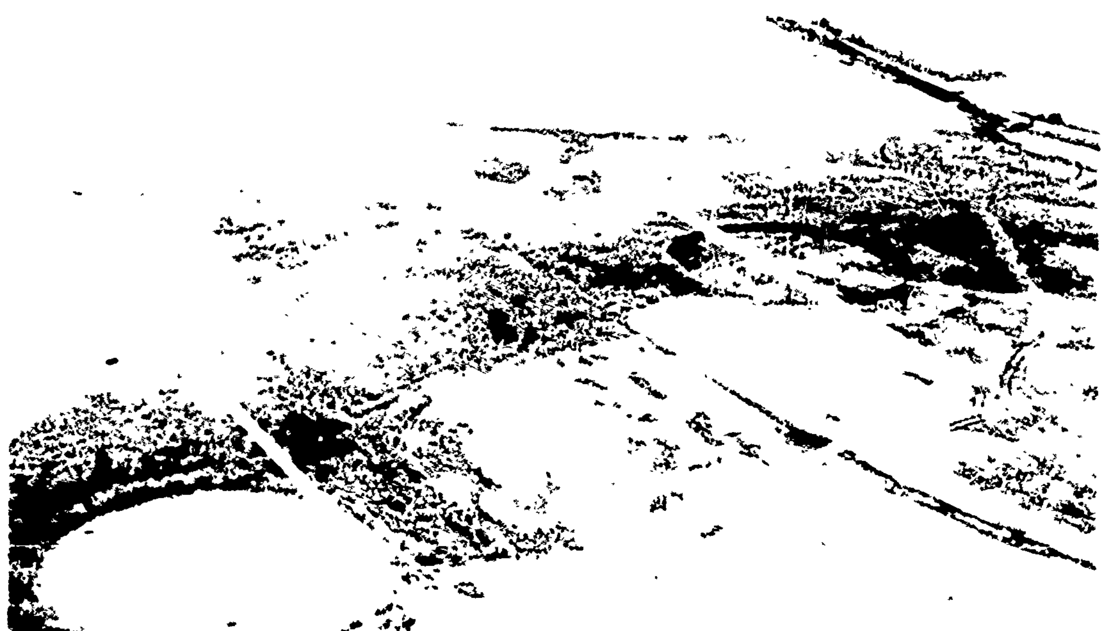

FIGURE A 21. Approximate location of old wastewater treatment plant site and sludge disposal area (Site No 6).

Appendix B

OUTSIDE AGENCY CONTACT LIST

Appendix B
OUTSIDE AGENCY CONTACT LIST

1. Virginia Water Control Board; Virginia Beach, Virginia. Point of Contact: Mr. Bob Aaron, 804/499-8742.

2. Virginia Department of Health; Virginia Beach, Virginia. Point of Contact: Mr. Harold Winer, 804/464-6078.

3. Virginia Air Pollution Control Board; Virginia Beach, Virginia. Point of Contact: Mr. Hammond, 804/499-6845.

4. U.S. Environmental Protection Agency--Region III; Philadelphia, Pennsylvania. Point of Contact: Mr. Francis Mulhern, 215/597-4799.

5. Peninsula Planning District Commission; Hampton, Virginia. Point of Contact: Mr. Henry Cochran, 804/838-4238.

6. City of Hampton Planning Department; Hampton, Virginia. Point of Contact: Mr. Horace Copeland, Jr., 804/727-6140.

7. Bureau of Shellfish Sanitation; Norfolk, Virginia. Point of Contact: Mr. Rudolph, 804/623-8461.

8. U.S. Geological Survey; Richmond, Virginia. Point of Contact: Mr. Herb Hopkins, 804/771-2427.

9. U.S. Department of Agriculture Soil Conservation Service; Richmond, Virginia. Point of Contact: Mr. Bob Hodges, 804/771-2463.

10. Virginia Division of Mineral Resources; Charlottesville, Virginia. 804/293-5121.

11. National Wildlife Federation; Washington, D.C. Point of Contact: Mr. Ken Kamlet, 202/797-2945.

12. Hampton Roads Sanitation District Commission; Virginia Beach, Virginia. Point of Contact: Mr. Guy Aydlett, 804/244-6041.

13. Old Dominion University; Norfolk, Virginia. Point of Contact: Dr. A. Umari, 804/440-3753.

14. U.S. Fish and Wildlife Service; Annapolis, Maryland. Point of Contact: Martha Carlisle, 301/269-6324.

15. Virginia Commission of Game and Inland Fisheries; Chesapeake, Virginia. Point of Contact: Mr. Mitchell Norman, 804/485-1126.

16. Council on the Environment; Richmond, Virginia. Point of Contact: Mr. J. B. Jackson, 804/786-4500.

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Appendix C

HISTORY OF LANGLEY AIR FORCE BASE

Appendix C
HISTORY OF LANGLEY AFB

1. History

Langley Air Force Base was established in 1917 as an experimental air field and proving ground for aircraft to be used by the Army and the newly founded National Advisory Committee for Aeronautics (NACA). The experimental station was officially named Langley Field in honor of Samuel Pierpont Langley, Secretary of the Smithsonian Institution and an early experimenter with aircraft.

The original Langley land acquisition included 1,670 acres consisting of several original land grant estates known as Sherwood, Lamington, Pools, and Moorefield, as well as a small portion of Canebrake Farm. The original site was bounded on the south by the southwest branch of Back River, on the east by Back River, on the north by Tabbs Creek, and on the west by Shellbank Farm.

Important advances were made at Langley during World War I including studies of bomb trajectories and the development of bomb sights and turn and bank indicators. In 1920 NACA completed the construction of an atmospheric wind tunnel, thereby initiating a new phase of aeronautical technology. Langley also housed a succession of lighter-than-air (LTA) balloons and Army airships during the 1920's. The most famous airship stationed at Langley was the Roma, which exploded over Norfolk in 1922. The LTA era at Langley gradually faded and came to an end in 1935.

Langley played an important role during the 1920's in the controversy over the superiority of air power in military operations. In bombing experiments based at Langley Field, Brigadier General Billy Mitchell and the First Provisional Air Brigade demonstrated the effectiveness of air power by sinking a variety of obsolete American ships and captured German vessels including the German dreadnought Ostfriesland.

In 1920 the United States Secretary of War authorized the establishment at Langley of the Air Service Field Officers School to train pilots and officers for staff work and the command of air tactical units. The school was renamed the Air Service Tactical School in 1922 and functioned at Langley until 1931 when it was moved to Maxwell Field and evolved into the Air University of today.

In 1935 the General Headquarters Air Corps (GHQ) was established at Langley Field. This was the first step toward the creation of an autonomous air arm within the U.S. Army. GHQ remained at Langley until 1941.

In 1937 control of Big Bethel was transferred to Langley Field from the jurisdiction of Fort Monroe. Big Bethel is located approximately 5 miles west of Langley Field. In 1941 a tract of land known as Shellbank was acquired, consisting of 770 acres adjacent to Langley Field.

At the end of World War II rumors were prevalent that Langley Field would be inactivated. However, Langley was subsequently given a training mission and, in 1946, was selected as the permanent home of Tactical Air Command (TAC). A separate Department of the Air Force was created in 1948 and in January 1948 Langley Field was redesignated as Langley Air Force Base.

There have been a number of TAC operating units assigned to Langley since World War II including:

a. The 405th Tactical Fighter-Bomber Wing equipped initially with P-47's, then F-84's, and finally F-100's, which operated from 1953 to 1960.

b. The 316th Tactical Airlift Wing equipped with C-130's, which operated from 1965 to 1975.

On the NASA side of Langley AFB, aeronautical research expanded to include aerospace activities and, in 1958, the National Advisory Committee for Aeronautics (NACA) became the National Aeronautics and Space Administration (NASA), which functioned as a separate Federal agency.

The current host unit at Langley is the 1st Tactical Fighter Wing, which is equipped with F-15s and represents the second largest wing within the Tactical Air Command.

2. <u>Mission</u>

The primary mission of the host unit at Langley (1st Tactical Fighter Wing) is as follows:

a. To attain and maintain the capability for rapid global deployment, thereby providing air superiority for U.S. or allied forces by engaging and destroying enemy forces, equipment, defenses, or installations.

b. To provide aircraft support for the Commander-In-Chief Atlantic Command.

c. To provide administrative and logistic support for Headquarters Tactical Air Command (TAC).

d. To provide administrative and logistic support for assigned and attached units and agencies at Langley AFB.

e. To command, manage, and operate Langley AFB.

The major tenant missions conducted at Langley AFB fall into the following basic categories:

a. Ready Alert Mission assigned to the 48th Fighter Interceptor Squadron.

b. Training/proficiency/transport for personnel assigned to Headquarters Tactical Air Command.

c. Special Operations carried out by the 6th Airborne Command and Control Squadron.

d. Transient Operations.

A composite list of the tenant units currently at Langley AFB is as follows:

AF Commissary Service
AFOSI District 21
Air-Land Forces Application Agency
CINCLANT Airborne Command Post
Det 1, 1402 Military Airlift Squadron
Det 6, Hq Air Weather Service
Det 6, 2000 Management Engineering Sq
Det 7, 3rd Weather Squadron
Det 339, AFAAO
Det 0300, AFAA, Hq Eastern Region
Hq Tactical Air Command
Hq TAC COMM Area

Systems Management Offices (F-16, PLS, GLCM)
Tactical Air Combat Operations Staff
TRADOC Flight Detachment, Spt Element
2nd Aircraft Delivery Group
5th Weather Wing
48th Fighter Interceptor Squadron
71st Aerial Port Squadron (AFRES)
72nd Tactical Control Flight
200th Weather Squadron (ANG)
201st Field Training Detachment
460th Reconnaissance Technical Squadron
564th Air Force Band
1913th Communications Squadron
4400th Tactical Control Squadron
4400th Management Engineering Squadron
4400th Contracting Squadron
4444th Ops Squadron
4500th Field Printing Squadron
4501st Computer Services Squadron
4525th Combat Applications Squadron
4545th Foreign Mil Tng Mgt Flt

Finally, Langley Air Force Base has the distinction of being the oldest continuously active Air Force base in the United States, and has played a vital role in the history of aviation.

Appendix D

BIOTA

Appendix D
BIOTA

1. Aquatic Systems

Back River has great significance to Langley AFB due to its proximity to the base. Indeed, Langley AFB adjoins on one side most of both the northwest and southwest branches of the Back River and also contains Tabbs Creek, which is tributary to the river. The Plum Tree Island National Wildlife Refuge, formerly part of Langley AFB, also directly adjoins the Back River.

Very little descriptive information is available on the Back River. However, it is similar to the York River lying just to the north, differing from it mainly in length and volume of flow. Consequently, much of the following description is excerpted from available descriptions of the York River.

a. Flora

Although the aquatic floral assemblages which occur in the Chesapeake Bay region are well known, the spatial and density distribution of the marine plants of the York and Back Rivers are as yet undetermined. In areas of the Bay and tributary rivers such as the York, benthic vascular plants appear widely distributed in shallow, quiet, and relatively clean water. Species composition is thought to be determined by such environmental factors as water salinity and bottom type. Salinity ranges tend to be associated with certain species (or species arrays), and in this region the following species can generally be found in the salinity ranges indicated below:

Species Name	Common Name	Habitat Salinity
Ceratophyllum demersum	Hornwort	Freshwater only
Vallisneria americana	Water-celery	Freshwater only
Potamogeton crispus	Pondweed	Fresh to 5 ppt
Zannichellia palustris	Horned pondweed	Fresh to 5 ppt
Elodea canadensis	Waterweed	Fresh to 10 ppt
Myriophyllum spicatum	Watermilfoil	Fresh to 10 ppt
Potamogeton perfoliatus	Pondweed	5 to 25 ppt
Zostera marina	Eelgrass	10 to 35 ppt
Ruppia maritima	Widgeon grass	5 to 40 ppt

These species all prefer soft bottom muds, occurring in 0.5 to 3 meters water depth, depending on turbidity. Some of these species have undergone population explosions which appear to be related to nutrient pollution. Waterweed and watermilfoil have at times been plant pests, the latter being most serious during the last 10 years (in the Chesapeake Bay region). Eelgrass is most commonly found growing over rich muds. Widgeon grass is detrimentally affected both by increased water temperature and increased water turbidity.

b. Fauna

Orth (1973) studied the benthic infauna of eelgrass (Zostera marina) beds in the Chesapeake Bay-York River estuaries [6]. Based on sampling between March and July of 1970, he reported a total of 117 macroinvertebrate taxa. Orth found that "macrofaunal density was higher than that of any other benthic habitat in the Chesapeake Bay." Marsh (1973) found 112 species of invertebrates in studies of the epifauna of Zostera in the York River [7]. He reported

that "exfoliation of Zostera after June caused a steady decline in plant biomass, but the abundance of the epifauna continued to increase into the summer and fall. Lowest total numbers and species counts occurred in February and early March.... The primary sources of nutrition for the epifauna appeared to be (1) plankton and suspended particulate matter, (2) detritus and microorganisms on the plant blades, and (3) epiphytic algae."

Oyster beds occur in various locations along the Back River and its tributary systems. Published data concerning the distribution of most other molluscan species of the Chesapeake Bay is very limited.

Blue crabs (Callinectes sapidus), grass shrimp (Palaemonetes), mud crabs (Xanthidae), and fiddler crabs (Uca) are the dominant decapod crustacean species in the area. The last three are extremely important as natural food resources for higher trophic level organisms. The blue crab is extremely important to the fisheries economy of the Chesapeake Bay and tributary rivers.

Markle (1976) reported a few important generalizations about York River fishes [8]. The mean number of species and the mean number of individuals in his monthly catches increased in spring, declined in summer, and reached their highest numbers in fall. The summer decline has been attributed to a drop in the dissolved oxygen concentration in waters near the bottom of the channel. Markle captured 98 fish species in the York River, and 12 of those species comprised over 92 percent of the total catch. The 12 important species are: hogchoker (Trinectes maculatus), white perch (Morone americana), spot (Leiostomus xanthurus), weakfish (Cynoscion regalis), bay anchovy (Anchoa mitchilli),

silver perch (Bairdiella chrysura), atlantic croaker (Micropogon undulatus), white catfish (Ictalurus catus), spotted hake (Urophycis regius), striped bass (Morone saxatilis), oyster toadfish (Opsanus tau), and channel catfish (Ictalurus punctatus). Hogchoker was by far the most abundant species, accounting for 53.2 percent of the total catch.

Six of these species (bay anchovy, oyster toadfish, hogchoker, white perch, white catfish, and channel catfish) spend their entire life in the area and are considered resident species. A seventh species, striped bass, was also considered resident because the captured individuals were predominantly 1 and 2 years old and had not yet begun seasonal migrations out of the river. The remaining five major species utilize the estuary as a nursery and are only present seasonally.

Resident fish species were generally least available during the summer and, except for the bay anchovy, numbers were also lowest in polyhaline areas. The bay anchovy was absent from low-salinity areas during the winter and spring, while distribution of oyster toadfish corresponded to the distribution of oyster reefs in the river. The two catfish species were distributed according to salinity levels, channel catfish being found primarily in freshwater, while white catfish had a much broader salinity tolerance.

c. Endangered Species

Freshwater fish species currently considered threatened by the Virginia Commission of Game and Inland Fisheries include the spotfin chub (Hybopsis monacha) and the yellowfin madtom (Noturus flavipinnis). These species may possibly occur in the York River or Back River.

The Shortnose sturgeon (Acipenser brevirostrum) is the only Atlantic coast estuarine/marine fish of the Virginia area that is currently considered endangered by the U.S. Fish and Wildlife Service. Its range extends from Massachusetts to the southwestern Florida peninsula. Its present occurrence in the vicinity of the Back River is not known.

2. Terrestrial Systems

Two comprehensive studies of the flora and fauna of Langley AFB have been prepared: "Preliminary Survey of the Flora and Selected Fauna of Langley Air Force Base" by M. A. Byrd and D. M. Ware [9]; and "A Survey of the Plant and Animal Communities of the Salt Marshes of the Langley Air Force Base - Langley Research Center, Virginia" by E. S. Wise [10]. These reports should be consulted for data more specific than those presented below.

a. Flora

Only a relatively small proportion of Langley is forested, reflecting both the historically agricultural use of this land and the subsequent development of the base. Roughly 10 percent of the 3,000 acres comprising the base can be defined as woodland (about 7 to 8 percent of the Air Force portion and 30 to 40 percent of the NASA portion). These woodland areas can be divided into two basic categories: mixed hardwood forests and pine forests. Non-forest communities include disturbed old-field areas undergoing succession (acreage is variable year to year), and tidal salt marshes (450 acres). These four plant communities are described below.

Mixed Hardwood Forests: Mixed hardwood forests on Langley AFB may be subdivided into mature mixed stands, stands dominated by sweetgum (Liquidambar styraciflua), and young hardwood stands undergoing succession.

Two moderately undisturbed mixed hardwood stands occur on Langley AFB, one on the northern boundary and one on the western boundary of the base. This latter stand is the most mature and diverse woodland on the base. Tree species typically encountered in these stands are white oak (Quercus alba), loblolly pine (Pinus taeda), sweetgum, red maple (Acer rubrum), cherrybark oak (Quercus falcata var. pagodaefolia), willow oak (Quercus phellos), swamp chestnut oak (Quercus michauxii), American ash (Fraxinus americana), black locust (Robinia pseudoacacia), and occasionally, tulip poplar (Liriodendron tulipifera) and sycamore (Platanus occidentalis). Understory vegetation includes saplings of sweetgum, red maple, hickory (Carya sp.), as well as pawpaw (Asimina triloba), serviceberry (Amelanchier sp.), dogwood (Cornus florida), highbush blueberry (Vaccinium atrococcum), blue beech (Carpinus caroliniana), and red chokeberry (Sorbus angustifolius). Ground cover vegetation is quite variable from one area to another, including Japanese honeysuckle (Lonicera japonica), poison ivy (Rhus toxicodendron), Virginia creeper (Parthenocissus quinquefolia), Christmas fern (Polystichum acrostichoides), and various herbaceous species.

Other hardwood tracts tend to be dominated by sweetgum, the degree of dominance varying from almost pure stands of sweetgum to stands in which sweetgum is codominant with other species. Other overstory species commonly encountered in sweetgum stands include: red maple, black cherry (Prunus serotina), loblolly pine, American holly (Ilex opaca), blackgum (Nyssa sylvatica), northern red oak (Quercus rubra), wax myrtle (Myrica cerifera), dogwood, sassafras (Sassafras albidum), and pawpaw.

Understory saplings are conspicuously absent from large areas within the sweetgum dominated stands, perhaps due to clearing, but in less recently disturbed sections there is abundant sweetgum reproduction. Japanese honeysuckle forms a moderate ground cover, especially in areas cleared of understory, and like poison ivy, it often climbs high into the trees. The herbaceous flora in these stands are limited, and include species such as spring beauty (Claytonia virginica), golden ragwort (Senecio aureus), Indian strawberry (Duchesnia indica), adder's tongue (Ophioglossum vulgatum), trumpet creeper (Campsis radicans), meadow fescue (Festuca elatior), and bluegrass (Poa pratensis).

Successional hardwood stands contain hardwood species that are not normally important components of mature communities and that tend to come into disturbed areas where mineral soil is not exposed, such as roadsides, fence-rows, pastures, and orchards. This is in contrast to the successional pattern on exposed mineral soil where pines have the competitive advantage. Black cherry, sassafras, persimmon (Diospyros virginiana), white mulberry (Morus alba), hackberry (Celtis sp.), tree-of-heaven (Ailanthus altissima), and American elm (Ulmus americana) are prime examples of successional tree species occurring on Langley AFB. Sweetgum, red maple, and blackgum are also found in some of these successional communities, though they also occur in more mature communities. In general, the ground surface of such areas supports thick growths of Japanese honeysuckle and blackberry (Rubus spp.)

Loblolly Pine Stands

There are four successful plantings of loblolly pine on the base: one maturing stand on a tract of about 12 acres, and 3 young tracts of 14, 31.5, and 2.5 acres.

The stand of maturing pines is located on the western boundary of the base and is essentially bisected by the Air Force-NASA property line. This stand is roughly 50 years old and will reach harvesting size in about 15 more years.

A hardwood understory of sweetgum, red maple, and black cherry has developed beneath the pines, and this understory is markedly taller in the segment of the stand on NASA property (indicating that hardwood thinning has been applied to the Langley AFB portion). Successional weedy and shrubby vegetation is abundant in the younger pine stands and includes a wider variety of species than in the mature stand.

Early Successional Communities

Early successional communities arise whenever the former vegetative cover of an area is disturbed or removed due to natural or human causes. Although much of the non-wooded land on Langley AFB is maintained and managed (e.g., yards of residential sections and military installations, the air field, and golf course), other areas such as old-fields, roadsides, fence-rows, and former landfill sites support a wide variety of herbs, grasses, and woody shrubs. Species composition in such areas depends upon soil type, season, degree of insolation, soil moisture, and time elapsed since last disturbance.

Tidal Salt Marshes

The tidal salt marshes of Langley AFB, and nearby Plum Tree Island National Wildlife Refuge are comprised of a number of distinct sub-communities, dominant vegetation being determined primarily by substrate elevation and the degree of tidal inundation. The dominant plant species of these seven subcommunities are: salt marsh cordgrass

(Spartina alterniflora), salt marsh cordgrass-dwarf form, salt meadow hay (Spartina patens), salt meadow hay and saltgrass (Distichlis spicata), saltgrass, black needlerush (Juncus roemerianus), and marsh elder (Iva frutescens).

The wetlands at Langley AFB are the only significant area remaining in a natural state and encompass about 450 acres. This area represents a highly valuable resource, especially considering that intensive development has resulted in the filling of many such areas outside of Langley AFB. The Virginia Wetlands Act of 1972 establishes a policy of resource management designed to preserve wetlands, prevent their degradation and destruction, and at the same time accommodate necessary economic development.

A very large tract of marsh occurs in the Plum Tree Island area, which was recently excessed and is now part of the National Wildlife Refuge system. The largest areas of marsh on Langley AFB are located along Tabbs Creek and along the Northwest Branch of the Back River in the area adjacent to the NASA Research Center. A smaller area of valuable marsh is located along Tides Mill Creek, an area threatened by extensive development occurring outside of the base.

b. Fauna

Although no year-long surveys of the vertebrate wildlife on Langley AFB have been conducted, a preliminary listing of expected species is presented in Appendix E.

White-tail deer (Odocoileus virginianus) is the only game species presently hunted on Langley AFB. In 1967, overpopulation of the deer herd resulted in a deer survey and an unsuccessful live-trapping operation. Controlled

hunting was first allowed in the winter of 1968, resulting in the harvest of 39 deer. After a 5-year lapse, controlled hunting was again introduced and incorporated into the Langley AFB wildlife management plan. In 1980, 22 deer were harvested.

Although small game hunting on Langley AFB was discontinued in 1967, limited trapping of fur-bearers is allowed. The primary species taken is the muskrat (Ondatra zibethicus).

The tidal marshes on Langley AFB and on adjoining lands constitute valuable waterfowl habitat, and are especially important wintering areas for the black duck (Anas rubripes), mallard (Anas platyrhynchos), gadwall (Anas strepera), and American widgeon (Mareca americana). The Plum Tree Island Refuge is also an important waterfowl haven in close proximity to Langley AFB.

Mosquitoes and Japanese beetles are the only insect pests requiring regular, widespread control on Langley AFB. Table D-1 provides a summary of the mosquito collection records for Langley AFB since 1965. For years, salt marsh breeding species Aedes sollicitans and A. taeniorhynchus have been the numerically predominant mosquitoes in the area. Since the beginning of the 1978 mosquito season, the relative numbers of the two Aedes species have decreased, and the numbers of Anopheles crucians, Culex pipiens, and C. salinarius have increased greatly. Aedes sollicitans is a primary vector of eastern equine encephalitis. Anopheles crucians is a potential vector of human malaria, and C. pipiens and C. salinarius are capable of transmitting St. Louis encephalitis.

Table D-1
MOSQUITO TRAP COLLECTIONS FROM LANGLEY AFB, VIRGINIA

Species	Number of Female Mosquitoes													Percent
	1965	1966	1967	1968	1969	1970	1971	1972	1973	1975	1976	1977	1978	of Total
Aedes														
atlanticus						1								<1
canadensis					2	24	19	1						<1
cantator		95	32	1	14	25	55	21	4					<1
cinereus					1			1	2			4		<1
grossbecki							3							<1
mitchellae					24				3	10	30	2		<1
sollicitans	135	2990	1290	73	2004	6131	6370	4642	169	713	1808	7092	2510	37.4
sticticus						1								<1
taeniorhynchus		11		1	133	400	1020	182	1	95	489	5613	179	8.4
triseriatus						2	4	30						<1
vexans	7	392	21	12	766	1022	1021	361	23	343	187	781	552	4.7
spp.						7				5	1	1	10	<1
Anopheles														
atropos							98							<1
crucians	22	193	57	2	353	772	1377	893	36	63	82	365	9470	14.2
punctipennis		4	2		1	7	37	3		4	1	74	117	<1
quadrimaculatus		13	1		24	37	31	101	10	37				<1
walkeri		17	3			2	7	45						<1
spp.										2		4		<1
Coquillettidia														
perturbans						12	24	11	118					<1

Table D-1--Continued
MOSQUITO TRAP COLLECTIONS FROM LANGLEY AFB, VIRGINIA

Species	1965	1966	1967	1968	1969	1970	1971	1972	1973	1975	1976	1977	1978	Percent of Total
	Number of Female Mosquitoes													
Culex														
erraticus	17	11			327	8				17	8	100	505	1.0
pipiens	9	8	11			1509	395	513	38		140	1537	3385	7.8
quinquefasciatus										7	54			<1
restuans	2	667	191		9	348	205	112	1	12			1	2.8
salinarius	19	1257	185	1	1551	2112	1231	1266	88	456	208	1212	8104	18.4
tarsalis										6	69	261	46	<1
territans				1		1		1						<1
spp.					14	31					1			<1
Culiseta														
inornata								3					1	<1
melanura								1			1			<1
Orthopodomyia														
signifera						79								<1
Psorophora														
columbiae	2	87	7	558		665	865	172	22	74	25	26	415	3.0
cyanescens													4	<1
ferox						1		1					1	<1
spp.										3				<1
Uranotaenia														
sapphirina	1	8		1		5	4	1						<1
Total Specimens	214	5753	1800	650	5223	13202	12766	8361	519	1847	3104	17072	25301	100
Collection Period	Sep-Oct	May-Oct	Apr-Aug	Mar-Sep	May-Oct	May-Oct	May-Oct	May-Oct	May-Oct	May-Oct	May-Oct	May-Aug	May-Sep	
Total Number of Species Identified	9	14	11	9	13	22	18	18	14	13	13	12	14	

The Japanese beetle, Popillia japonica, was introduced into the United States at Riverton, New Jersey, in 1916. This pest has since spread south to Alabama, north into lower Nova Scotia and Ontario, and west into Missouri. The larvae (grubs) feed on plant roots and live in the soil from late summer of one year to the spring of the following year. The adults usually emerge from the ground during May through July, with the adult population numbers normally peaking during early July. The adults feed on at least 300 plant species and are serious defoliators of shrubs, trees, and various fruit and vegetable crops.

c. Endangered Species

Tables D-2 and D-3 list the endangered and threatened terrestrial flora and fauna which may be found in the project area. The occurrence of most of the animals on the list is very unlikely.

The red-cockaded woodpecker has not been sighted in the area for several years, the last sighting in Virginia being from the Dismal Swamp area of Chesapeake City.

Two endangered raptors which occur infrequently in the Langley AFB area are the bald eagle and peregrine falcon. Bald eagles formerly nested in much of coastal Virginia, although active nests have declined remarkably in the past two decades. Birds sighted at or near Langley in recent years probably are transients, the nearest known active nests being at Jamestown Island and possibly at Seashore State Park. The peregrine falcon has been recorded a number of times from Grandview Beach, approximately 3.5 miles east of Langley AFB. These falcons probably occur as transients, though the waterfowl population at Langley is sufficient to allow overwintering of falcons.

Table D-2
ENDANGERED TERRESTRIAL FAUNA POSSIBLY OCCURRING IN SOUTHEASTERN VIRGINIA[1]

Species	Common Name
BIRDS	
Haliaeetus leucocephalus	Southern Bald Eagle
Falco peregrinus[2]	Peregrine Falcon
Dendrocopus borealis	Red-Cockaded Woodpecker
Dendroica kirtlandii[2]	Kirtland's Warbler
MAMMALS	
Felis concolor cougar	Eastern Cougar
Sciurus niger cinereus	Delmarva Peninsula Fox Squirrel

[1]All listed species designated as endangered by the U.S. Fish and Wildlife Service and State of Virginia.

[2]Transient only.

Table D-3
ENDANGERED (E) AND THREATENED (T)
FLORAL SPECIES OF SOUTHEAST VIRGINIA[1]

	Species	Common Name	Habitat
E	Lechea maritima var. virginica	Pin-weed	Open sands
E	Hypoxis longii	Stargrass	Open sands
E	Trillium pusillum var. virginianum	Trillium	Mesic woodlands
E	Isotria medeoloides	Small whorled pogonia	Xeric woodlands
E	Panicum mundum	Panic-grass	Bogs
E	Bacopa stragula	Water-hyssop	Tidal mud
T	Oxypolis canbyi	--	Bogs
T	Ilex amelanchier	Holly	Sandy swamps
T	Hexastylis lewisii	Heartleaf	Dry woodlands
T	Echinacea laevigata	Purple coneflower	Fields
T	Eupatorium saltuense	--	Woodlands
T	Rudbeckia heliopsidis	Coneflower	Pine woods
T	Cardamine longii	Bitter cress	Tidal muds
T	Carex chapmanii	Carex	--
T	Juncus caesariensis	Rush	Swampy woods
T	Pycnanthemum monotrichum	One-haired basil	Xeric woods
T	Calamovilfa brevipilis var. brevipilis	--	Sandy bogs
T	Calamovilfa brevipilis var. calvipes	--	Sphagnum bogs
T	Panicum aculeatum	Panic-grass	Swampy woods
T	Micranthemum micranthemoides	--	Tidal muds
T	Platanthera flava	Pale green orchis	Swampy woods

[1]No Federally listed species present, all endangerment designations are by State of Virginia.

Osprey, although no longer technically endangered have also been sighted several times in the Langley area, with one active nest site being located within the Cape Charles installation.

Two additional avian species which occur in the area are rare but do not qualify for endangered or threatened status. Both of these, the golden plover (Pluvialis dominica) and buff-breasted sandpiper (Tryngites subruficollis), use short grass fields for resting areas during migration, and both are recorded each summer from the grassy fields adjoining the airplane runways at Langley. This site is among the few places in the state at which these birds are recorded.

The Delmarva fox squirrel has not been reported on the western shore of Chesapeake Bay, but there has been very little work done in establishing its distribution. It is always possible that one or more could be transported across the bay. Thus, there exists some possibility that the Delmarva fox squirrel could be present in the mature mixed pine-hardwood stands of the region. The nearest occurrence of the eastern cougar is probably in the Dismal Swamp, about 40 miles to the south.

No endangered reptiles or amphibians occur in close proximinity to Langley AFB.

3. Environmental Stress

A review of available Langley AFB documents and cursory onsite examinations of the biological systems on Langley AFB revealed no evidence of significant environmental stresses related to hazardous wastes. Many of the previous woodland

areas have been removed or disturbed with the construction and maintenance of the installation but, except for the landfill areas, such disturbance is now relatively infrequent.

Although periodic discharge of incompletely treated municipal wastewater from Langley AFB into the Southwest Branch Back River has contributed to the pollution loading of this system, the problem at Langley AFB has been resolved and such incidents are not expected to recur. A 1972 study of oyster tissues collected from the Back River showed lower heavy metal concentrations than those found in the James and York Rivers. Minor fish kills (minnows) have occurred in some of the drainage ditches on Langley AFB, but subsequent tissue and water analyses indicated that these were due to natural causes (i.e., low dissolved oxygen) and not to toxic material contamination.

There is no evidence of significant environmental stress resulting from the periodic application of non-persistent pesticides on Langley AFB. Use of persistent pesticides such as DDT and Dieldrin on Langley AFB was discontinued in 1958, with Malathion and Dibrom being the presently preferred agents.

Appendix E

SPECIES LIST

Appendix E
REPRESENTATIVE MAMMAL, BIRD, REPTILE, AND AMPHIBIAN SPECIES EXPECTED TO OCCUR IN THE VICINITY OF LANGLEY AFB

(A) Game and fur-bearing species indigenous to the installation:

Striped skunk	*Mephitis mephitis nigra*
Long tailed weasel	*Mustela frenata noveboracensis*
Eastern cottontail	*Sylvilagus floridanus mallurus*
Grey squirrel	*Sciurus carolinesis carolinensis*
Muskrat	*Ondatra zibethicus macrodon*
Mink	*Mustela vison mink*
Grey fox	*Urocyon cinereoargenteus*
White-tail deer	*Odocoileus virginianus*
Opossum	*Didelphis marsupialis virginiana*
Red fox	*Vulpes fulva fulva*
Raccoon	*Procyon lotor lotor*
River otter	*Lutra canadensis lataxina*

Land and Shore Birds

Woodcock	*Philohela minor*
Snipe	*Capella gallinago*
Mourning dove	*Zenaidura macroura*
Bobwhite quail	*Colinus virginianus*

Waterfowl

Canada goose	*Branta canadensis*
Brant	*Branta bernicla*
Mallard	*Anas platyrhynchos*
Black duck	*Anas rubripes*
Gadwall	*Anas strepera*
Pintail	*Anas acuta*
Blue-winged teal	*Anas discors*
American widgeon	*Marcea americana*
Shoveler	*Spatula clypeata*

Wood duck	Aix sponsa
Redhead	Aythya americana
Ring-necked duck	Aythya collaris
Canvasback	Aythya valisineria
Greater scaup	Aythya marila
Lesser scaup	Aythya affinis
Goldeneye	Bucephala clangula
Bufflehead	Bucephala albeola
Oldsquaw	Clangula hyemalis
Common eider	Somateria mollissima
King eider	Somateria spectabilis
White-winged scoter	Melanitta deglandi
Surf scoter	Melanitta perspicillata
Common scoter	Oidemia nigra
Ruddy duck	Oxyura jamaicensis
Hooded merganser	Lophodytes cucullatus
American merganser	Mergus merganser
Red-breasted merganser	Mergus serrator
King rail	Rallus elegans
Clapper rail	Rallus longirostris
Virginia rail	Rallus limicola
Sora	Porzana carolina
Common gallinule	Gallinula chloropus
American coot	Fulica americana

(B) Non-Game Species Indigenous to the Installation. (Partial listing).

Mammals

Southeastern shrew	Sorex longirostris longirostris
Least shrew	Cryptotis parva parva
Short-tailed shrew	Blarina brevicanda carolinensis
Eastern mole	Scalopus aquaticus aquaticus
Little brown bat	Myotis lucifugus lucifugus
Keen's bat	Myotis keenii septentrionalis
Silver-haired bat	Lasionycteris noctivigans

Eastern pipistrelle	*Pipistrellus subflavus subflavus*
Big brown bat	*Eptesicus fuscus fuscus*
Red bat	*Lasiurus borealis borealis*
Southern flying squirrel	*Glaucomys volans volans*
Harvest mouse	*Reithrodontomys humedis virginianus*
White-footed mouse	*Peromyscus leucopus leucopus*
Rice rat	*Oryzomys palustris palustris*
Meadow vole	*Microtus pennsylvanicus pennsylvanicus*
Norway rat	*Rattus norvegicus*
House mouse	*Mus musculus brevirostris*

Birds

Flicker	*Colaptes auratus*
Red-bellied woodpecker	*Centurus carolinus*
Downy woodpecker	*Dendrocopos pubescens*
Tree swallow	*Iridoprocne bicolor*
Blue jay	*Cyanocitta cristata*
Carolina chickadee	*Parus carolinensis*
Tufted titmouse	*Parus bicolor*
White-breasted nuthatch	*Sitta carolinensis*
House wren	*Thryothorus aedon*
Carolina wren	*Thryothorus ludovicianus*
Common crow	*Corvus brachyrhynchos*
Fish crow	*Corvus ossifragus*
Ruby-throated hummingbird	*Archilochus colubris*
Mockingbird	*Minus polyglottos*
Catbird	*Dumetella carolinensis*
Brown thrasher	*Taxostroma rufum*
Robin	*Turdus migratorius*
Hermit thrush	*Hylocichla guttata*
Veery	*Hylocichla fuscescens*
Golden-crowned kinglet	*Regulus satrapa*
Ruby-crowned kinglet	*Regulus calendula*
Cedar waxwing	*Bombycilla cedrorum*
Black and white warbler	*Mniotilta varia*

Myrtle warbler	Dendroica coronata
Louisiana waterthrush	Seiurus motacilla
Yellowthroat	Geothlypis trichas
American redstart	Geothlypis trichas
Rusty blackbird	Euphagus carolinus
Common grackle	Quiscalus quiscula
Brown-headed cowbird	Molothrus ater
Cardinal	Richmondena cardinalis
American goldfinch	Spinus tristis
Rufous-sided towhee	Pipilo erythrophthalamus
Savannah sparrow	Passerculus sandwichensis
Field sparrow	Spizella pusilla
White-throated sparrow	Zonotrichia albicollis
Swamp sparrow	Melospiza georgiana
Song sparrow	Melospiza melodia
Brown-headed nuthatch	Sitta pusilla
Brown creeper	Certhia familiaris
Parula warbler	Parula americana
Yellow-throated warbler	Dendroica dominica
Pine warbler	Dendroica pinus
Palm warbler	Dendroica palmarum
Cattle egret	Bubulcus ibis
Snowy egret	Egretta thula
Glossy ibis	Plegadis falcinellus
Louisiana heron	Hydranassa tricolor
Blue-gray gnatcatcher	Polioptila caerulea
White-eyed vireo	Vireo griseus
Great blue heron	Ardea herodias
Little blue heron	Florida caerulea
Fulvous tree duck	Dendrocygna bicolor
Red-tailed hawk	Buteo jamaicensis
Marsh hawk	Circus cyaneus
Sparrow hawk	Falco sparverius
Golden plover	Pluvialis dominica
Buff-breasted sandpiper	Tryngites subruficollis
Common egret	Casmerodius albus

Killdeer	Charadrius vociferus
Herring gull	Larus argentatus
Yellow-bellied sapsucker	Sphyrapicus varius
Eastern kingbird	Tyrannus tyrannus
Purple martin	Progne subis
Starling	Sturmus vulgaris
House sparrow	Passer domesticus
Eastern meadowlark	Sturnella magna
Red-winged blackbird	Agelaius phoeniceus
Slate-colored junco	Junco hyemalis

Reptiles and Amphibians

Red-backed salamander	Plethodon cinereus cinereus
Slimy salamander	Plethodon gultinosus glutinosus
Eastern spadefoot toad	Scaphiopus holbrooki
Fowler's toad	Bufo woodhousei fowleri
Southern toad	Bufo terrestris
Northern spring peeper	Hyla crucifer crucifer
Pinewoods treefrog	Hyla femoralis
Eastern gray treefrog	Hyla versicolor versicolor
Green treefrog	Hyla cinerea
Upland chorus frog	Pseudacris triseriata feriarum
American frog	Bufo americanus
Snapping turtle	Chelydra serpentina
Stinkpot	Sternothaerus odoratus
Mud turtle	Kinosternon subrubrum subrubrum
Box turtle	Terrapene carolina carolina
Northern diamondback terrapin	Malaclemye terrapin terrapin
Eastern fence lizard	Sceloporus undulatus hyacinthinus
Glass snake lizard	Ophisaurus attenuatus longicaudus
Six-lined racerunner	Cnemidophorus sexlineatus
Five-lined skink	Eumeces fasciatus
Broad-headed skink	Eumeces laticeps
Ground skink	Lygosoma laterale
Eastern ringneck snake	Diadophis punctatus

Eastern garter snake	*Thamnophis sirtalis sirtalis*
Northern black racer	*Coluber constrictor constrictor*
Black rat snake	*Elaphe obsoleta obsoleta*
Eastern kingsnake	*Lampropeltis getulus getulus*
Southern copperhead	*Agkistrodon contortrix contortrix*

Fish

Blueback herring	*Alosa aestivalis*
Alewife	*Alosa pseudoharengus*
American shad	*Alosa sapidissima*
Striped anchovy	*Anchoa hepsetus*
Bay anchovy	*Anchoa mitchilli*
American eel	*Anguilla rostrata*
Four spine stickleback	*Apeltes quadracus*
Silver perch	*Bairdiella chrysura*
Black sea bass	*Centropristic striatus*
Banned blenny	*Chasmodes bosquianus*
Spotted sea trout	*Cynoscion nebulosis*
Weak fish	*Cynoscion regalis*
Smallmouth flounder	*Etropus microstomus*
Cling fish	*Gobiesox strumosus*
Naked gobie	*Gobiosoma bosci*
Common american seahorse	*Hippocampus hudsonius*
Feather blenny	*Hypsoblennius hentizi*
White catfish	*Ictalurus catus*
Spot	*Leiostomus xanthurus*
Pumpkin seed	*Lepomis gibbusus*
Blue gill	*Leopmis macrochirus*
Silver side	*Menidia menidia*
Southern king fish	*Menticirrhus americanus*
Northern king fish	*Menticirrhus saxatilis*
Clown goby	*Microgobius thalassinus*
Croaker	*Micropogon undulatus*
White perch	*Morone americana*
Striped bass	*Morone saxatilis*

Spottail shiner	Notropis hudsonius
Oyster toad	Opsanus tau
Summer flounder	Paralichthys dentatus
Butter fish	Peprilus alepidotus
Yellow perch	Perca flavescens
Winter flounder	Pseudopleuronectes americanus
Northern sea robbin	Prionotus carolinus
Striped sea robbin	Prionotus evolans
Window pane	Scophthalmus aquosus
Northern puffer	Sphoeroides maculatus
Hog choker	Trinectes maculatus
Spotted hake	Urophycis regirs

Appendix F

GEOLOGY

Appendix F
GEOLOGY

1. Physiography/Topography/Drainage

Langley Air Force Base is located in the outer coastal plain of southeastern Virginia. The base is situated on the Hampton Flat (see Figure 5) between the northwest and the southwest branches of the Back River. Plum Tree Island is located in the trough and ridge area north of the confluence of the northwest and southwest branches of the Back River. Cape Charles Air Force Station is located across Chesapeake Bay on the Eastern Shore.

The coastal plain in eastern Virginia is characterized by a series of flat plains and intervening scarps. The Big Bethel scarp, occurring just west of the base, forms the western boundary of the Hampton Flat [11]. This scarp rises above the flat to the elevation of the Todds Flat of approximately 25 feet above mean sea level (msl). This scarp is clearly visible on the topographic map illustrated on Figure 6.

The Big Bethel scarp extends from the York River near Yorktown southeastward nearly to Huntington Park, at which point it curves eastward parallel to Jefferson Boulevard in Newport News. This scarp not only forms the boundary between Hampton Flat and Todds Flat but also constitutes the boundary between the Hampton Flat and the Huntington Flat. The base of the scarp lies at approximately 17 feet msl and the crest reaches a maximum elevation of 35 feet msl (see Figure 6).

Along the northern section, in the vicinity of Newport News, the scarp was formed by the erosion of the Sedge Field member of the Tabb formation by water of the Chesapeake Bay

during a higher stand of sea level. The southeastern segment is eroded into the sand facies (stratigraphic unit) of the Norfolk formation (see Table F-1), a thin layer of sand and gravel of the Lynnhaven member of the Tabb formation.

The Hampton Flat, on which Langley Air Force Base is situated, is the principal physiographic feature in the lower part of York County and the Cities of Newport News and Hampton. The flat, as discussed above, is bounded on the west and southwest sides by Big Bethel and Harpersville scarps. Boundaries are formed to the north by the York River to the east by Plum Tree Island trough and ridge, and to the south by Hampton Roads The surface of the Hampton Flat has a gentle eastward slope of 1.0 foot per mile. The flat is nearly featureless with the exception of stream valleys of the New Market, Brick Kiln, Tabbs Creek, and other small creeks. Drainage in the flat areas between streams is poor, and swamps such as Sawyers Swamp were common in the western part of the area before stream channels were dredged. Saltwater and freshwater marshes are common along the major streams flowing into Chesapeake Bay. Typical is the marsh occurring at the mouth of Tabbs Creek. Although the Lynnhaven member of the Tabb formation underlies most of the Hampton Flat, in some locations the weathered Yorktown formation occurs at the surface.

Plum Tree Island occurs within a distinctive physiographic unit consisting of coastal salt marshes and linear ridges referred to as the Plum Tree Island trough and ridge area. Big Salt Marsh and the marshes north of Grand View and in Tide Mill Creek have developed in the shallow trough between partially submerged linear ridges such as Grunland Point and the necks of land leading to Amorys Wharf and Messick Point. Sand beaches and dunes are in the process of migrating westward over the salt marshes. The Poquoson member of the Tabb formation is the surficial sediment over most of this area.

Table F-1
GEOLOGIC UNITS AND THEIR WATER-BEARING CHARACTERISTICS

System	Series[1]	Age[1]	Formation[2]	Approximate Thickness (feet)	Lithologic Character	Hydrologic Comments
Quaternary	Post-Miocene			20 - 100	Mostly sands and gravels of fluvial and terrace deposits	Supplies ground water to low yield water table wells throughout the area
Tertiary	Miocene	Late Miocene Middle Miocene	Yorktown	0 - 150	Fossiliferous sands, marls, and coquinas	Supplies ground water to water table wells in parts of the area
	Miocene	Late Miocene Middle Miocene	St. Mary's	0 - 150	Dark-colored sands, silts, and clays; often referred to as "blue sand" and "blue clay"	Acts as a confined bed for the upper artesian aquifer system
	Miocene	Late Miocene Middle Miocene	Calvert	0 - 60	Fossilferous silts and sands, occasionally glauconitic	Upper artesian aquifer; yields sufficent water for domestic subdivision and light agricultural and industrial purposes
	Eocene	Jackson	Chickahominy	0 - 30	Fine- to medium-grained sands, poorly to moderately sorted, occasionally glauconitic	Upper artesian aquifer; yields sufficient water for domestic, subdivision, and light agricultural and industrial purposes
	Eocene	Claiborne	Nanjemoy (Claiborne Age)	0 - 80	Fine- to medium-grained sands, poorly to moderately sorted, occasionally glauconitic	Upper artesian aquifer; yields sufficient water for domestic, subdivision, and light agricultural and industrial purposes
	Paleocene	Mioway	Nanjemoy (Wilcox Age) Aquia Mattaponi	0 - 100	Highly glauconitic sands, silts and clays; often referred to as "greensand" or "black sand"	Generally an aquitard: confining layer for principal aquifer system; basal sand is part of principal aquifer system

Table F-1
Page 2
GEOLOGIC UNITS AND THEIR WATER-BEARING CHARACTERISTICS

System	Series[1]	Age[1]	Formation[2]	Approximate Thickness (feet)	Lithologic Character	Hydrologic Comments
Cretaceous	Lower Cretaceous	F G H	Mattaponi (Lower) Potomac Group	0 - 1500	Interbedded sands, silts, and clays of fluvial and detaic origin; some thin marginal marine beds; unit F dominantly silts and clays of interdelta region in extreme eastern part of the area	Capable of high yield with proper development in most areas of York-James Peninsula; mostly undeveloped at present time
Triassic					Predominantly soft red and brown shales; some thin beds of hard red shale and sandstone	Supplies ground water to a few low-yield water table wells in Ashland area
Pre-Triassic Crystalline Rock					Highly variable rock types	Supplies moderate quantities of ground water to deep wells near Fall Zone

[1]Brown (1972)
[2]Cederstrom (1957)

SOURCE: Virginia State Water Control Board-BWCM.

The north section of Langley AFB and Langley Research Center (NASA) is drained by Tabbs Creek (see Figure 6). This stream follows a meandering or winding course generally in a northeast direction, discharging into the northwest branch of the Back River.

Most of the runoff from the runway area at Langley is directed to the southwest branch of the Back River. The northmost portion of Langley Research Center (NASA) is drained by Brick Kiln Creek. Runoff from the southern portion of Plum Tree Island is generally south into the Back River.

The topography of the base is very flat, showing little or no relief. Most of Langley AFB occurs between elevations of 5 to 8 feet above msl. The southern portions of Plum Tree Island occur at elevations of less than 5 feet above msl. Elevations at Cape Charles Air Force Station are generally between 8 and 12 feet above msl.

2. <u>Surface</u>

Surfacial deposits occurring at Langley AFB consist of alluvial sediments, primarily sandy, silty clay or silty, clayey, sand. The alluvium or river-deposited sediments had an upland origin but were transported by the James, York, and Back Rivers and deposited within their flood plains during a higher stand of sea level. Locally on the base there are deposits of organic rich soil having an estuarine or lagoon depositional environment. Figure 7 illustrates surface and near-surface deposits in the Langley area.

Sand dunes occur at the surface on Plum Tree Island and Cape Charles Air Force Station. These dunes are composed of quartz sand and reach a maximum elevation of approximately 10 feet. Major beaches in the dune line have been created by storms such as hurricanes occurring in 1933 and 1962.

In natural areas, the dunes are migrating westward covering over marsh deposits at a rate locally that exceeds 6 feet per year.

3. Subsurface

The known subsurface deposits or stratigraphic sequence at Langley AFB consists of sediments ranging in age from early Cretaceous (approximately 135 million years ago) to Holocene (recent).

Tables F-1 and F-2 present the geologic formations underlying Langley AFB and their descriptions.

The pre-Cretaceous (older than 135 million years) basement rock complex consists of consolidated sedimentary rocks and various crystalline rocks, including granite and diorite. The basement rock occurs at approximately 2,200 feet below land surface (bls) at Langley and Plum Tree Island and approximately 2,600 feet bls at Cape Charles.

The Cretaceous deposits at Langley AFB consist of discontinuous sand layers interbedded with silts and clays. These deposits occur as two units, the lower Cretaceous, Potomac group, and the upper Cretaceous Mattaponi formation and extend from approximately 700 feet to 2,200 feet bls. Both formations were deposited as channel deposits from a meandering stream or further to the east as estuarine deposits. The Cretaceous formations represent the principal aquifer in Virginia and are capable of yielding large quantities of water in the Williamsburg and Yorktown areas.

Paleocene sediments overlie the Cretaceous materials in the vicinity of Langley AFB and consist of fine- to medium-grained sands interbedded with silty clays. Three formations, the Nanjemoy, Aquia, and Mattaponi (Glaconitic member) occur

Table F-2
GEOLOGIC FORMATIONS IN THE NEWPORT NEWS NORTH AND HAMPTON AREA

Age	Formation	Name	Character	Thickness in feet (m)
Holocene		Alluvium	Fluvial and fluvial-estuarine sand, silt, and clay, locally organic-rich and gravelly.	0 - 125 (0 - 38)
		Marsh sediment	Organic-rich clay, silt, and sand; peat.	0 - 12 (0 - 4)
		Sand	Beach and dune sand.	0 - 10 (0 - 4)
Pleistocene	Tabb Formation	Poquoson Member	Beach and nearshore marine and fluvial estuarine fine to medium sand and sandy clay; basal gravelly sand.	0 - 9 (0 - 3)
	Tabb Formation	Lynnhaven Member	Nearshore marine clayey sand, sandy clay, and gravel, beach sand, and cobbly gravel.	0 - 9 (0 - 3)
	Tabb Formation	Sedgefield Member	Brackish-bay sand and nearshore marine clayey sand; lagoonal marsh clay and clayey sand; basal fossiliferous gravelly and clayey sand.	0 - 11 (0 - 3)
	Sand Bridge Formation Upper Member	Silty-sand facies	Fluvial and lagoonal silty sand.	0 - 8 (0 - 2)
	Sand Bridge Formation Upper Member	Clayey-sand facies	Fluvial-estuarine and nearshore marine clayey sand; silt.	0 - 25 (0 - 8)
	Sand Bridge Formation Upper Member	Silty-clay facies	Marsh and tidal-flat silty clay; tidal channel clayey sand.	0 - 7 (0 - 2)
Pleistocene	Norfolk Formation Upper Member	Silty-sand facies	Brackish marine clayey medium sand, fine sandy silt, and clayey silt.	0 - 15 (0 - 5)
	Norfolk Formation Upper Member	Sand facies	Beach and nearshore marine fine to coarse sand; clayey silt.	0 - 35 (0 - 11)
	Norfolk Formation Upper Member	Clayey-sand facies	Fluvial and estuarine fossiliferous clayey sand, organic-rich clay, silt, and peat.	0 - 85 (0 - 26)
	Windsor Formation		Marine and lagoonal fine to coarse sand, silty and clayey sand, and silt.	0 - 15 (0 - 5)
Pliocene	Yorktown Formation		Marine sand, silt, and coguina.	0 - 125 (0 - 38)

as the Paleocene unit. Farther to the west, some of the sands are composed largely of dark green to black Glauconitic sands. Paleocence strata form the aquitard or confining bed for the lower Cretacous aquifer.

The Eocene strata are divided into the Nanjemoy and Chickahominy formations. Farther to the east but in the vicinity of Langley, the Eocene units are thin or absent.

Miocene deposits are divided into three formations: the Calvert, St. Marys, and Yorktown, in the study area. Miocene deposits extend from approximately 40 feet bls to 600-700 feet bls in the Langley area. The top part of the Miocene consists of shells and shell fragments cemented with calcite. This unit grades downward to a fine-grained quartz sand with a gradual decrease in shell. Traces of biotite and glauconite occur in the sand. Miocene sediments, having been deposited in a shallow marine environment, are fairly consistent and have a wide areal extent.

Post-Miocene deposits in the Langley area consist of marine, brackish, beach, fluvial, and marsh deposits. Table F-2 lists the post Miocene formations and their characteristics in the Langley area.

The Pliocene Yorktown formation consists of marine sand, silt, and coquina.

The Pliestocence strata consist of the Norfork, Sand Bridge, and Tabb formations, which range from estuarine clay, silt deposits to beach deposits consisting of sand and gravel.

Holocene materials consist of sand, marsh sediments, and alluvium.

Figures 8 and 9 illustrate east-west and north-south geologic cross sections in the Langley area.

4. Soil

Most of the base consists of soils low in fertility or natural productivity. Soils consist of clayey, silty sand or sandy, silty, clay [13, 14, 15, 16, 20, 21]. At Cape Charles the soil consists mainly of medium sand [17, 18]. Five areas have been identified as prime farmland by the Soil Conservation Service:

(1) Area 1: Approximately 9.2 acres of unimproved land west of Armistead Avenue.

(2) Area 2: Approximately 2.5 acres of semi-improved grassland north of Warehouse Road (now Sweeney Boulevard) between the Flight Simulator and the 48th FIS complex.

(3) Area 3: Approximately 4.5 acres of unimproved forest west of Durand Road. This area is included in the Base Forest Management Plan.

(4) Area 4: Approximately 10.3 acres of unimproved forest adjacent to Poplar Road. This area is included in the Base Forest Management Plan.

(5) Area 5: Approximately 21.0 acres of semi-improved grassland south and west of the LTA area.

5. Ground Water

The water supply for Langley AFB and NASA facilities is obtained from surface-water sources, primarily Big Bethel Reservoir [23]. Currently there are plans to develop ground-water supplies in the vicinity of Big Bethel Reservoir to augment the surface source.

Ground water occurs in three aquifer systems at Langley AFB: the shallow water table aquifer, the upper artesian aquifer system, and the principal artesian aquifer system [12, 25, 26, 27].

The water table aquifer is an important source of domestic water supply farther to the west in King Williams, Charles City, New Kent, James City, and York Counties. In parts of Newport News and Hampton, there are areas where domestic ground water is supplied by shallow wells ranging in depth from 50 to 100 feet. These wells are probably completed in the water table aquifer which occurs from approximately 5 feet bls to a depth of approximately 100 ft bls. The water table aquifer occurs within the fine sands, silts, and shell beds of Pleistocene age and surficial sands of recent or Holocene age. This aquifer produces rather small quantities of water in most places. Some homes and small farms west of Langley AFB have reported yields from shallow wells of 5 to 15 gpm. These deposits, having a marine origin, are lenticular in cross section and occasionally a well is reported to yield as much as 40 gpm. Such wells are probably completed within a locally thick section of shell. Permeability within the water table aquifer probably ranges from 1×10^{-3} to 1×10^{-5} cm/sec.

Water quality from shallow wells varies according to proximity to saltwater bodies. Some wells have been reported to yield freshwater initially but quickly turn salty. This is due to the fact that freshwater floats on top of the denser saltwater. However, tidal action keeps the interface in a constant state of change. The thickness of freshwater overlying the saltwater is very small, and thus pumpage quickly removes the freshwater from the water table in the vicinity of the pumped well. Recharge to the water table aquifer is direct from rainfall, and freshwater is added back to the water table aquifer.

The three wells at Cape Charles Air Force Station are approximately 80 feet deep and are completed in the water table aquifer; however, the freshwater lens is much thicker here. This is due to the fact that there is a thick beach and dune sand stratum which rises to an elevation of approximately 12 feet msl. The combination of higher elevation and lack of clay and silt results in a buildup of freshwater from local rainfall, since the aquifer has more storage capacity.

The upper artesian aquifer system consists of glauconitic and quartz sands and marls of Eocene age, and shell, sand, silt, and clay beds of Miocene age. This aquifer is of little importance in the Langley area since yields are very low. Some wells are completed in the Miocene Yorktown formation, which contains sand lenses that locally yield water.

An artesian aquifer, by definition, is one in which the water level or potentiometric surface occurs above the top of the aquifer. The special case in which the water level occurs above not only the aquifer but also land surface results in flow wells.

Wells completed in the upper artesian aquifer in the vicinity of Langley can be expected to contain as much as 950 parts per million (ppm) chlorides, with hardness of approximately 230 ppm.

The principal artesian aquifer consists of coarse sand, gravel, and boulders of Cretaceous age. West of Langley AFB the aquifer has the potential to yield large quantities of water. Recharge to this aquifer occurs many miles west, approximately at the fall line. Moving west, water quality improves such that in the Williamsburg area this aquifer supplies large amounts of potable water.

Test wells have been drilled in the vicinity of Langley, and logs from these wells indicate that yields should be high at depths below 600 feet. Although yields would be high from this aquifer in the Langley area, water quality is very poor. Chlorides could be expected to be in the range of 4,000 to 5,000 ppm. There is the possibility that locally within some Cretaceous strata water may be of better quality. One well in Newport News completed in this aquifer was reported to have chlorides of 600 ppm. This is still unfit for most uses, but significantly better than expected from this area. Figure 10 illustrates the 1972 potentiometric surface of the principal artesian aquifer.

Ground-water withdrawals in the Williamsburg area have caused a reversal in the flow of ground water from south, southeast to north, northwest. A cone of depression has formed around Williamsburg (not shown on map) such that ground-water flow in all directions is toward Williamsburg.

6. Geological Aspects of Potential Migration

The surface and near-surface strata at Langley AFB are moderate to low in permeability due to the occurrence of clay and silt with the sand. Past disposal practices, with regard to solid waste primarily, could result in the movement of some leachate radially away from the disposal sites. Travel time would be extremely slow due to the low permeability and the very low hydraulic gradient. The shallow water table aquifer would be the only water-bearing formation affected by this contamination since the upper artesian and principal artesian aquifer systems are hydraulically separated from this water table aquifer by clay confining beds. The contamination from past disposal sites would probably be limited to the immediate general vicinity of the disposal site. In any case, there is little likelihood that any

ground-water contamination has occurred offsite from Langley AFB, because the direction of ground-water flow within all three aquifer systems is from west to east.

However, even though ground-water movement at Langley within the water table aquifer is generally toward the east, flow paths bend to intercept the branches of the Back River at right angles.

Disposal practices by Langley are intended to prevent ground- and surface-water contamination. There is very limited data currently available regarding ground-water conditions at Langley AFB. Information presented here is from published sources extrapolated to Langley for the most part.

There is apparently one or more old water wells rumored to exist in the LTA area; however, this could not be confirmed from existing records nor field observation.

Appendix G

PESTICIDE AND HERBICIDE
USAGE AT LANGLEY AFB

Appendix G
HISTORY OF MILITARY AERIAL SPRAY OPERATIONS FOR MOSQUITO CONTROL AT LANGLEY AFB (1948-1978)

Date	Acreage	Pesticide	Rate of Application
29 Apr 48	4400	-	-
13-14 May 48	2988	-	-
24 Jun 48	2530	-	-
20,21 Jul 48	3065	-	-
11 Sep 48	2650	-	-
19,21 May 49	3685	DDT	-
14,20 Jun 49	4812	DDT	-
15 Jul 49	6550	DDT	-
28 Jul 49	4085	DDT	-
26 Aug 49	5225	DDT	-
15,16,19 Sep 49	7342	DDT	-
16 Apr 50	4382	DDT	-
9,11 May 50	8264	DDT	-
28 May 50	7800	DDT	-
23,28 Jun 50	7332	DDT	-
15 Jul 50	7800	DDT	-
31 Jul, 2 Aug 50	6864	DDT	-
29,30,31 Aug 50	5740	DDT	-
19 Oct 50	2808	20% DDT	-
2 May 51	5746	20% DDT	-
25 May 51	9357	20% DDT	-
12,13,14 Jun 51	14437	20% DDT	-
23 Jun 51	7847	20% DDT	-
26 Jun 51	1162	20% DDT	-
2,3 Jul 51	7731	20% DDT	-
21,24,26 Jul 51	10172	20% DDT	-
2 Aug 51	6278	DDT	-
15 Aug 51	3488	DDT	-
15,18 Aug 51	19048	DDT	-
24,25 Aug 51	6104	20% DDT	-
24,25 Aug 51	8134	20% DDT	-
27,28 Aug 51	5233	DDT	-
4,5 Sep 51	6941	DDT	-
13,14 Sep 51	8486	DDT	-
6 Oct 51	4243	DDT	-
6 Oct 51	3488	DDT	-
31 Oct 51	3864	DDT	-
17,24,27 May 52	19000	20% DDT	-
6,10 Jun 52	5304	DDT	-
3 Jul 52	2475	20% DDT	-
12,13 Jul 52	10464	Chlordane	-
26 Jul 52	2087	Chlordane	-

*The data in this Table is fragmentary due to the compilation being derived from multiple incomplete sources.

Date	Acreage	Pesticide	Rate of Application
12 Aug 52	3488	DDT	-
18,21 Aug 52	10464	DDT	-
14 Sep 52	2000	20% DDT	-
16 Sep 52	7500	20% DDT	-
20 Sep 52	1872	20% DDT	-
21 Sep 52	1872	20% DDT	-
29 Sep 52	3500	20% DDT 37% Chlordane	-
4 Oct 52	3000	DDT 37% Chlordane	-
6 Oct 52	1877	3% Chlordane	-
13,14 Oct 52	7451	DDT	-
17 Oct 52	762	DDT	-
22 Oct 52	530	DDT	-
24 Oct 52	1487	DDT	-
8,9,11 May 53	6378	7% Lindane	-
25,26 May 53	8092	8.2% Lindane	-
29,30 May 53	8092	7% Lindane	-
6,7 Jun 53	4920	7% Lindane	-
22,23,26 Jun 53	2750	5% & 8% Lindane	-
7,8,9 Jul 53	8092	5% & 7% Lindane	-
28-30 Jul 53	4860	7% Lindane	-
13 Aug 53	2430	7% Lindane	-
24 Aug 53	3645	7% Lindane	-
29 Aug 53	8000	7% Lindane	-
18 Sep 53	4860	7% Lindane	-
8,15 Oct 53	4700	7% Lindane	-
20 Apr 54	4331	8% Lindane	-
11 May 54	260	20% Lindane	-
19,22 May 54	6640	7% Lindane	-
23 Jun 54	6025	7% Lindane	-
17 Jul 54	5560	8% Lindane	-
26 Jul 54	2600	20% DDT	-
21 Aug 54	2800	7% Lindane	-
2,3 Sep 54	2000	20% DDT	-
29 Apr & May 55	5652	7% Lindane	-
12 May 55	1894	7% Lindane	-
22,23 Jun 55	7895	7% Lindane	-
19 Jul 55	2421	7% Lindane	-
20 Jul 55	1818	7% Lindane	-
27 Aug 55	5263	7% Lindane	-
9 Sep 55	2920	7% Lindane	-
17 Sep 55	954	5% Lindane	-
17 Sep 55	4905	5% Dieldrin	-
20 Apr 56	6499	6% Lindane & 6% Dieldrin	-
26 Apr-2&4 May 56	7465	6% Dieldrin	-
11,12 May 56	9250	6% Lindane	-
8,9,14 Jun 56	1667	6% Lindane	-
12,13 Jun 56	8000	6% Lindane	-
28,29 Jun 56	8167	6% Lindane	-
17 Jul 56	8846	6% Lindane	-

Date	Acreage	Pesticide	Rate of Application
21,26,27 Jul 56	9000	6% Lindane	-
31 Jul,1,2 Aug 56	7500	7% Lindane	-
16,17,18 Aug 56	13000	6% Lindane	-
23,24 Aug 56	5500	6% Lindane	-
30,31 Aug 56	9402	6% Lindane	-
5 Sep 56	4166	6% Lindane	-
13,14 Sep 56	7333	6% Lindane	-
9 Oct 56	2167	6% Lindane	-
15,16 Oct 56	6000	6% Lindane	-
18,23 Oct 56	3333	6% Dieldrin	-
31 Oct 56	2250	6% Dieldrin	-
8 Nov 56	500	6% Lindane	-
23 Apr 57	4450	7% Dieldrin	-
24,25,26 Apr 57	270	10% Dieldrin	-
12 May 57	4166	21% Malathion	-
25 May 57	2166	12% Malathion	-
7 Jun 57	2167	12% Malathion	-
14 Jun 57	1333	12% Malathion	-
21 Jun 57	2448	12% Malathion	-
22 Jun 57	404	12% Malathion	-
1 Jul 57	2217	12% Malathion	-
25,26,29,30, 31 Jul,1 Aug 57	1557	10% Dieldrin	-
3 Aug 57	437	12% Malathion	-
7 Aug 57	4333	12% Malathion	-
20 Aug 57	2166	12% Malathion	-
27 Aug 57	1166	12% Malathion	-
30 Aug 57	3000	12% Malathion	-
4 Sep 57	3750	12% Malathion	-
5 Sep 57	1000	12% Malathion	-
13 Sep 57	3157	12% Malathion	-
25 Sep 57	3173 & 1917	12% Malathion & 8% Dieldrin	-
9 Oct 57	3232	20% DDT & 8% Dieldrin	-
6,8 Nov 57	3750	8% Dieldrin	-
15 Apr 58	1418	12% Malathion	-
18,19,20 Apr 58	11525	12% Malathion	-
1 May 58	10000	12% Malathion	-
10 May 58	842	27% Malathion	-
14,16,17 May 58	16558	10% Malathion	-
5 Jun 58	9535	12% Malathion	-
13 Jun 58	3479	12% Malathion	-
19 Jun 58	1682	12% Malathion	-
24 Jun 58	10438	12% Malathion	-
4 Jul 58	13396	12% Malathion	-
21-26 Jul 58	17397	12% Malathion	-
9,10 Aug 58	15657	12% Malathion	-
4,5 Sep 58	15657	12% Malathion	-
15 Oct 58	15657	12% Malathion	-
4,5 May 59	6958	12% Malathion	-
9 May 59	8699	12% Malathion	-
25,26,27 May 59	13042	12% Malathion	-

Date	Acreage	Pesticide	Rate of Application
2,4 Jul 59	9536	12% Malathion	-
17,18 Jul 59	13918	15% Malathion	-
26 Jul 59	15690	15% Malathion	-
10 Aug 59	15660	15% Malathion	-
28 Aug 59	15660	15% Malathion	-
15,16 Sep 59	15289	15% Malathion	-
18 Sep 59	3184	15% Malathion	-
6,7,12,13 Oct 59	18428	15% Malathion	-
7,8 Apr 60	13507	15% Malathion	-
19,20 Apr 60	13920	15% Malathion	-
13 May 60	13920	15% Malathion	-
24,25 May 60	13234	15% Malathion	-
3-5 Jun 60	13920	15% Malathion	-
20,22 Jun 60	13920	15% Malathion	-
29 Jun,1 Jul 60	12180	15% Malathion	-
20-22 Jul 60	15660	15% Malathion	-
5 Aug 60	12180	15% Malathion	-
11,14 Aug 60	12180	15% Malathion	-
27,28 Aug 60	13920	15% Malathion	-
14,15 Sep 60	13920	15% Malathion	-
11 Oct 60	13920	7% Malathion	-
1961 (15 sprays)	257873	Malathion	-
1962 (15 sprays)	290454	Malathion	-
1963 (12 sprays)	260698	Malathion	-
1964 (11 sprays)	214512	Malathion	-
1965 (11 sprays)	280532	Malathion	-
1966 (9 sprays)	296556	Malathion	-
1967 (11 sprays)	334442	Malathion	-
1968 (12 sprays)	371920	Dibrom 14	-
1969 (12 sprays)	232655	Dibrom 14	-
1970 (10 sprays)	237945	Dibrom 14	-
1971 (8 sprays)	275064	Dibrom 14	-
1972 (8 sprays)	124496	Dibrom 14	-
22 May 73	38400	Dibrom 14	0.75oz/acre
6 Jun 73	20000	Dibrom 14	" "
27 Jun 73	43000	Dibrom 14	" "
24 Jul 73	45300	Dibrom 14	" "
16 Aug 73	43000	Dibrom 14	" "
29,30 Aug 73	38016	Dibrom 14	" "
11 Jun 74	43000	Dibrom 14	" "
18 Jul 74	31200	Dibrom 14	" "
13 Aug 74	42000	Dibrom 14	" "
27 Aug 74	21000	Dibrom 14	" "
17 Sep 74	6000	Dibrom 14	" "
17 Jun 75	43000	Dibrom 14	" "
17 Jul 75	42360	Dibrom 14	" "
6 Aug 75	41894	Dibrom 14	" "
4 Sep 75	25600	Dibrom 14	" "
30 Sep 75	43000	Dibrom 14	" "

Date	Acreage	Pesticide	Rate of Application
29 Sep 76	41,935	Dibrom 14	0.75 oz/acre
2 Jun 77	42,439	"	"
22 Jun 77	42,496	"	"
1 Jul 77	16,640	"	"
7 Jul 77	42,339	"	"
27 Jul 77	11,393	"	"
2 Aug 77	43,000	"	0.60 oz/acre
31 Aug 77	42,439	"	0.75 oz/acre
27 Sep 77	42,439	"	"
26 May 78	31,494	"	"
15 Jun 78	36,900	Dibrom:HAN (1:5)	1.5 oz/acre
26 Jun 78	43,000	"	"
25 Jul 78	43,000	"	"
8 Aug 78	43,000	Dibrom 14	0.75 oz/acre
22 Aug 78	11,309	Dibrom:HAN (1:5)	1.5 oz/acre
23 Aug 78	36,304	"	"

CURRENT PESTICIDES USED AT LANGLEY AFB

Item	Concentration (percent)	Area Treated	Number of Applications
Pivalyl	.025	500 acres (Base Area)	6
Diphacinone	.005	500 acres (Warehouses)	6
Ficam-W	76.	1,995,980 sq. ft. (Food Facilities)	6
Dursban	41.2	2,100,862 sq. ft. (Military Housing)	2
Dursban	41.2	1,896,323 (Military Housing)	2
Phenothrin	1.92	9,995,980 sq. ft. (Food Facilities)	6
Altosid	7.9	3,260 acres (Standing Water Areas)	6
Dibrom	85.	3,000 acres (Base Area)	16
Sibrom	85.	38,000 acres (Langley, Hampton, Doquoson, Yorktown)	3
Benlate	50	265 acres (Sycamore Trees)	3
Spectracide	25.	Base Area (Various Shrubs and Trees)	
Benlate	25.	728 acres (Crepe Myrtle)	5
Sevin	80.	3,600 acres (Base Area)	2
Roundup	41.	900 acres (Flightline, Fences, Sidewalks)	6
Sacamine	33.	1,000 acres (Turf and Lawns)	1
Hevar X	80.	960 acres (Flightline and Fences)	6
Malathione	57.	3,000 acres (Base Areas)	100
Chlordane	1.	25,000 sq. ft. (Subterranean Termite Control)	1
B-Gone	1.	2,100,862 sq. ft. (Housing and Offices)	2
Milky Spore	.016	200 ac; 331 ac (Golf Courses)	1

Appendix H

RESULTS OF PCB ANALYSES IN TRANSFORMERS

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS TACTICAL AIR COMMAND
LANGLEY AIR FORCE BASE, VIRGINIA 23665

20 DEC 1979

REPLY TO ATTN OF: DEEV

SUBJECT: Polychlorinated Biphenyls (PCB) Management (Your Ltr, 29 Nov 79)

TO: 1 CSG/DE

1. Reference: TAC/DEEV Ltr, 7 Dec 79, Polychlorinated Biphenyls Final Rule.

2. Subject letter indicated that PCB analysis was being performed on transformer dielectric and contract storage/disposal with General Electric was being studied. Request you advise us NLT 10 Jan 80 of the outcome of these two items. If your effort to contract with GE is unsuccessful request you program facility construction for FY 80. If project estimate exceeds base approval authority request you submit your proposed revision to the priority listing to TAC/DEPD.

FOR THE COMMANDER

James R Calfee
JAMES R. CALFEE
Asst Director of Eng & Const

	ACTION	INFO
DE		
DDE		
DEA		
DEU		
DEE		
DEF		
DEH		
DET		
DEM		
DEMR		
DES		
CCO		
RETURN TO DEA		

21 Dec 79

RECEIVED 21 DEC 1979

Readiness is our Profession

interscience
research
~~[illegible]~~
LABORATORY ADDRESS
2614 WYOMING AVE. NORFOLK, VA. 23513

1CSG/DEEV
Langley Air Force Base, VA 23665
Attention: Mr. Chris Pflum

December 11, 1979

Samples: High Voltage Transformer Oils
Source: Langley Air Force Base
Date Collected: 11/19/79
Sampler: J.H. Guth
Analysts: J.H. Guth, Ph.D., S. Viet

REPORT OF LABORATORY ANALYSES

Detectable and significant levels of polychlorobiphenyls(PCB's) were observed in transformers numbers 1 - 9 and 12 - 17. PCB residues were not found in transformers numbers 10,11, and 18.

The method of analysis was by a procedure issued by the U.S.E.P.A., using electron capture gas chromatography.

Recommendations: All but the three unaffected transformers should be disposed of according to E.P.A. guidelines. The groundsoil where transformer oil has leaked should be removed to an approved disposal site. The appropriate DOT containers must be used for the drained oils and soils. These contaminated materials are disposable at an approved PCB disposal site in Williamsburg, Ohio. The earth must be excavated to a point where the ground concentration of PCB's is less than 50 ppm.

Report prepared by Joseph H Guth Ph. D. 12/11/79

interscience research

[illegible]

LABORATORY ADDRESS
2614 WYOMING AVE. NORFOLK, VA. 23513

ICSC/DEEV
Langley Air Force Base, VA 23665
Attention: Mr. Chris Pflum

December 22, 1979
553 8815

Sample: High Voltage Transformer Oils
Source: Langley Air Force Base
Date Collected: 11/19/79

ADDENDUM TO REPORT OF LABORATORY ANALYSES, DATED 12/11/79

Sample	PCB level, ppm
T-1 124 gal	580
T-2 32 gal	228
T-3 15 gal	116
T-4 9 gal	125
T-5 22 5 gal	319
T-6 54 gal	1,274
T-7 39 gal	321
T-8 14 gal	729
T-9 18 gal	113
T-10 132 gal	undetectable
T-11 132 gal	undetectable
T-12 32 gal	191
T-13 35 gal	296
T-14 20 gal	202
T-15 31 gal	136
T-16 32 gal	315
T-17 170 gal	267
T-18 [illegible]	undetectable

Report prepared by Joseph H Gul Ph.D 12/22/79

interscience research, inc.
2614 wyoming ave. norfolk, Va 23513 (804)853-0813

September 3, 1980

Lt. Sebastian Romano
1 CSC/DEEV
Langley AFB, VA 23665

Samples: 7 Transformer Oils for PCB Determination
Source: Langley Air Force
Date Collected: 8/14/80
Sampled By: S. Viet
Analyst: S. Viet

REPORT OF LABORATORY ANALYSES

Sample	PCB Level, ppm
D-1 275 gal	None Detected
T-A 170 gal	29
T-B	66
T-C	105
T-D 9 gal	585,000
T-E 9 gal	595,000
T-F 9 gal	526,000

Report Prepared By Joseph H Smith Ph.D. 9/3/80

Appendix I

WATER QUALITY

Appendix I
WATER QUALITY

1. Surface

The Commonwealth of Virginia has established both stream utilization and quality standards as set forth in the publication "Water Quality Standards." The State Water Control Board administers these standards, which became effective July 20, 1970. The requirements for all basins is that the waters be satisfactory for public or municipal water supply, primary contact recreation, and the propagation of fish and aquatic life.

The estuarine system encompassing the Langley AFB area is composed of the following river basins:

- York River
- Back River
- Poquoson River
- James River/Hampton Roads

These river basins have been designated as "Water Quality Sensitive Basins" by the Hampton Roads Water Quality Agency (HRWQA), the local water quality planning agency in the area.

The Back River, a small sub-estuary of the Chesapeake Bay, directly encompasses Langley AFB. The Back River drainage basin includes much of the Cities of Poquoson and Hampton, and a small portion of Newport News. The majority of the land drained is rural in nature. Because the river

has little freshwater inflow, circulation depends on tidal influences. Pollutant loading to the river from point sources is very small, with most of the loading coming from nonpoint sources. Since the Back River has sections leased as shellfish beds, public or private, "Special Standards," as outlined in Table I-1, "Stream Quality Standards," are applicable.

The Bureau of Shellfish Sanitation, State Department of Health, Commonwealth of Virginia, is responsible for making periodic surveys to determine if an area is safe for harvesting shellfish. Water quality data from the Virginia Water Control Board, Tidewater Regional Office, for the Back River are presented in Table I-2.

General water quality in the Back River is good, with total organic nitrogen of less than 0.10 mg/l and a soluble reactive phosphorus level of 0.03 mg/l. Ammonia nitrogen levels are generally less than 0.1 mg/l. Chlorophyll "a" varies from 23 mg/l in shallow trenches to 2 mg/l at the mouth of the river. Dissolved oxygen (DO) concentrations are as high as 9 mg/l during the day but fall during the night to as low as 4.5 mg/l. Fecal coliform bacterial levels range from 2 to 12 colonies/100 ml in various parts of the river. Due to nonpoint source pollution (sewage spill) resulting from abnormally heavy rainfall during May 1979, portions of Back River have been temporarily closed to shellfish harvesting (see Figure 4).

In order to evaluate possible pollutant discharges into nearby surface waters, selected runoff points at Langley AFB are sampled at least quarterly and analyzed for general water pollutants that may be generated or used at Langley AFB [45]. A total of 11 sampling sites (see Figure 16) have been established and are listed below:

Table I - 1
STREAM QUALITY STANDARDS

Basin and Section: Chesapeake Bay and Atlantic Ocean, Section 2

Location:	Chesapeake Bay and its tidal tributaries from Thimble Shoal Channel north to Virginia-Maryland state line between Longitude 76 degrees 10' W and east-west divide boundary on the eastern shore of Virginia.
Water Use Class:	IIB
Water Use Designation:	Generally satisfactory for use as public or municipal water supply, primary contact recreation (prolonged intimate contact: considerable risk of ingestion), propagation of fish and other aquatic life, and other beneficial uses.
Dissolved Oxygen:	Minimum--4.0 mg/l daily Average--5.0 mg/l
Coliform Organisms:	Fecal coliforms (multiple-tube fermentation or MF count) within a 30-day period not to exceed a log mean of 200/100 ml. Not more than 10 percent of samples within a 30-day period will exceed 400/100 ml. Monthly average not more than 2400/100 ml. (MPN or MF count). Not more than 2400/100 ml in more than 20 percent of samples in any month.
pH:	6.0 to 8.5
Temperature °F:	Rise above Natural: September through May 4.0; June through August 1.5 Maximum: None
Special Standards:	In those sections where leased, private, or public shellfish beds are present, the median MPN shall not exceed 70/100 ml and not more than 10 percent of the samples ordinarily shall exceed an MPN of 230/100 ml for a 5-tube decimal dilution test (or 330/100 ml where a 3-tube decimal dilution test is used). The shellfish area is not to be contaminated by radionuclides, pesticides, herbicides, or fecal material so that consumption of the shellfish may be hazardous.

SOURCE: Virginia State Water Control Board, Water Quality Standards. November 1974.

Table I-2

WATER QUALITY DATA FOR BACK RIVER

Location of Sampling Point	Water[a] Temperature (°F)	DO[a] (mg/l)	pH[a] (SU)	Fecal Coliform (col./100 ml)
Southwest Branch Back River Rt. 278 Br.	72.2	7.6	8.5	43[b]
Southwest Branch Back River at light near Langley Yacht Basin	71.5	7.4	8.6	23[b]
Southwest Branch at Willoughby Point Light	71.0	7.7	8.7	6.4[c]
Northwest Branch Back River mid-channel off Oak Island, York County	72.0	8.2	8.6	Not Available from State Dept. of Health
Northwest Branch Back River mid-channel off Tin Shell Point	71.8	7.8	8.7	< 3[c]
Back River at light off Stoney Point	70.5	7.8	8.7	< 3[c]
Back River at mid-channel off Northend Point	69.8	7.9	8.8	< 3[c]

[a] Data represents average values for samples taken April 29, 1976; May 5, 1976; June 10, 1976; July 8, 1976; August 16, 1976; and September 21, 1976. Source: Virginia State Water Control Board, Tidewater Regional Office.

[b] Data represents median value for samples collected on 4 dates during February through May, 1977. Source: Bureau Shellfish Sanitation, Virginia State Department of Health.

[c] Data represents median value for samples collected on 12 dates during January through December, 1976. Source: Bureau Snellfish Sanitation, Virginia State Department of Health.

NOTE: SU = Standard pH units.

Sampling Site No.	General Location	Receiving Waters/System
1	Drainage ditch near Bldg. 366	Southwest Branch of Back River
2	Drainage ditch east of aircraft apron	Southwest Branch of Back River
3	Conduit near Building 633	Southwest Branch of Back River
4	Oil separator effluent at Building 643	Sewer system
5	Drainage ditch POL area near Building 720	Northwest Branch of Back River
6	Drainage ditch near Bldg. 900	Northwest Branch of Back River
7	Drainage ditch near Bldg. 1300	Tabbs Creek and Northwest Branch of Back River
8	Drainage ditch adjacent to Warehouse Road	Tide Mill Creek and Southwest Branch of Back River
9	Conduit near Building 252	Southwest Branch of Back River
10	Conduit near POL Dock, Building 721	Southwest Branch of Back River
11	Drainage ditch near fire training area	Tabbs Creek and Northwest Branch of Back River

Samples are taken and prepared as prescribed by the Environmental Protection Agency (EPA) for preservation and shipped to the USAF Environmental Health Laboratory (USAF EHL) at Brooks AFB, Texas, for analysis. All routine samples are evaluated for the following:

(1) Oil and grease
(2) Surfactants
(3) Total Organic Carbon (TOC)
(4) Dissolved Solids
(5) Total Kjeldahl Nitrogen (as N)
(6) Nitrates
(7) Phenols
(8) Chloride
(9) Sulfates
(10) Cadmium
(11) Chromium (Hexavalent)
(12) Chromium (Total)
(13) Copper
(14) Cyanides
(15) Iron
(16) Lead
(17) Manganese
(18) Silver
(19) Zinc
(20) Mercury

Sample results are compared to previous sample results at each point and evaluated by the bioenvironmental engineer for significant pollutant levels. Based on a review of the results tabulated by the bioenvironmental engineer, certain pollutants were observed to fluctuate slightly above normal levels. These fluctuations are infrequent and should not adversely affect water quality in Back River.

2. Subsurface

There are no records of subsurface water quality available at Langley AFB. Data regarding the chemical characteristics of ground-water within the three distinct aquifer systems is available from nearby wells; this data can be extrapolated to the Langley area with some degree of reliability.

The shallow water table aquifer occurring from approximately land surface to a depth of 100 feet contains local lenses of freshwater. The upper artesian aquifer system is locally unimportant and contains brackish water. The principal artesian aquifer system also contains salty water in the Langley area. A more detailed discussion of these aquifer systems is presented in Appendix F, Section 5.

Appendix J

HAMPTON ROADS SANITATION DISTRICT
INDUSTRIAL WASTEWATER DISCHARGE PLANT
AND WASTEWATER MONITORING RESULTS

HAMPTON ROADS SANITATION DISTRICT

INDUSTRIAL WASTEWATER DISCHARGE PERMIT

Permit No. 0011

In accordance with all terms and conditions of the Hampton Roads Sanitation District Industrial Wastewater Discharge Regulations, and in accordance with any applicable provisions of Federal or State law or regulation;

Permission Is Hereby Granted To: Department of the Air Force - Langley Air Force Base, Virginia

Classified by SIC No. 9711

For the contribution of Industrial Waste (Combat Support Center)

into the Hampton Roads Sanitation District at Magruder Boulevard just north of Sheppard Avenue.

This permit is based on information provided in the permit application which together with the following conditions and requirements is considered a part of this permit. This permit is not transferable.

Effective this 1st day of October 1979

To Expire 1st day of October 19[illegible]

General Manager

HAMPTON ROADS SANITATION DISTRICT

INDUSTRIAL WASTEWATER DISCHARGE PERMIT

(EFFLUENT LIMITATIONS)

Permit No. 0011

The following referenced parameters are known to exist in the permittee's discharge through information provided in the permit application. The limitations set forth below shall be met at all times. In addition, all other effluent limitations and general discharge prohibitions set forth in the Hampton Roads Sanitation District's Industrial Wastewater Discharge Regulations and all applicable Federal and State limitations shall be met.

PARAMETER	LIMITATIONS CALENDAR MO. AVERAGE* (mg/l)	CALENDAR DAY MAXIMUM** (mg/l)
Arsenic (As)		
Boron (B)		
Cadmium (Cd)		
Chromium, Total (Cr)		
Copper (Cu)		
Cyanide (CN)		
Lead (Pb)		
Mercury (Hg)		
Nickel (Ni)		
Phenolic Compounds		
Silver (Ag)		
Zinc (Zn)		
Oil & Grease (Non-Saponifiable)	100 mg/l	100 mg/l
pH	[illegible].0 - 9.0	6.0 - [illegible].0
Flow	[illegible].027 MGD	[illegible].108 MGD
BOD		
SS		
Other		

* Average of any number of daily values obtained during a calendar month.

** Maximum for any sample obtained during any calendar day.

INDUSTRIAL USER FILE

HAMPTON ROADS SANITATION DISTRICT

INDUSTRIAL WASTEWATER DISCHARGE PERMIT
(MONITORING AND METERING REQUIREMENTS)

Permit No. 0011

Monitoring Requirements: One (1) composite sample (at least hourly samples composited for the work day) shall be taken and analyzed for pH and Oil and Grease monthly on alternating work days (Monday of the 1st month, Tuesday of the 2nd month, etc.). Results of analyses shall be forwarded, in writing, to HRSD within ten (10) days of sampling date.

All analyses shall be performed in accordance with Section 402 of the HRSD's Industrial Wastewater Discharge Regulations.

Metering Requirements: Metering for billing purposes shall be one (1) effluent meter (Fisher-Porter Model 10D1416A) located in the Langley Air Force Base Final Pump Station. Said meter shall be certified as accurate to manufacturer's specifications at least annually. A copy of said certification shall be forwarded to HRSD within thirty (30) days of certification date.

HAMPTON ROADS SANITATION DISTRICT

INDUSTRIAL WASTEWATER DISCHARGE PERMIT
(COMPLIANCE SCHEDULE)

Permit No. 0011

Compliance Schedule: All pretreatment facilities (oil-water separators and grease traps) shall be maintained on the appropriate bi-weekly, monthly or quarterly schedule submitted with the permit application. All material removed from said pretreatment shall not be discharged directly or indirectly to HRSD.

All monitoring and metering requirements shall commence on the effective date of this permit.

INDUSTRIAL USER FILE

Langley A. F. B.

1980 Grab Sampling

Month	pH	O&G	Chlorides	Phenols	Cr	Cu	Zn	Pb	Ni	Cd	CN⁻	Hg	Initials
January	7.00	57	354	<0.1									BDJ
February 4 1645	7.01	35	84	0.15									W.C.H.
March Survey													
April 2 0945	7.15	57	139	0.17									W.C.H.
May 13 1055	6.96	49	146	0.37									WCH
June 11 1421	7.09	37	102	0.10									W.C.H.
July													
August 13 1000	7.64 ~~8.46~~	49	75	.085									WCH.
September 8 1435	7.14	110	75	0.07									W.C.H.
October 2 1340	7.16	30	265	0.19									WCH
November 12 1415	7.22	39	137	0.06									W.C.H.
December 2 1530	6.85	77	116	1.17									W.C.H.

February 17, 1981

Commanding Officer
Department of the Air Force
Langley Air Force Base, VA 23665

Dear Sir:

Enclosed please find the results of analyses of composite samples taken during a wastewater monitoring survey at this facility for the period January 26 - February 1, 1981.

The calculated values for BOD and Suspended Solids do not warrant continuation of the surcharge, therefore the surcharge will be discontinued from billing as February 1, 1981.

Please note that phenols were in violation of the HRSD Industrial Wastewater Discharge Regulations. Please address the cause and steps to be taken to prevent reoccurrence within thirty (30) days of receipt of this letter.

Thank you for your cooperation in this matter.

Very truly yours,

W. C. Hammersley
Industrial Specialist

WCH/jps
Enclosures

/LOCATION: Langley Air Force Base, Hampton

DATE OF SURVEY: January 26 - February 1, 1981

DATE	DAY	pH	BOD mg/1	SS mg/1	OIL GREASE	FLOW (gals.)	BOD lbs.	SS lbs
1-26	Mon.	7.32	297	267	48	997,000	2469.55	2220.1
1-27	Tues.	7.27	202	181	25	974,000	1640.88	1470.2
1-28	Wed.	7.20	238	274	51	1,270,000	2520.85	2902.1
1-29	Thurs.	7.43	275	279	30	1,036,000	2376.07	2410.6
1-30	Fri.	7.34	300	292	64	777,000	1944.05	1892.2
1-31	Sat.	7.16	216	177	49	719,000	1295.24	1061.3
2-1	Sun.	7.32	232	193	56	847,000	1638.84	1363.3
						6,620,000 Total	13,885.48 Total	13,320. Total

$$\text{BOD} = \frac{13{,}885.48}{6.620000 \times 8.34} = 252 \text{ mg/1 (No Surcharge)}$$

$$\text{SS} = \frac{13{,}320.10}{6.620000 \times 8.34} = 241 \text{ mg/1 (No Surcharge)}$$

OF [illegible] - Langley Air Force Base, Hampton (1981)

Date	COD (mg/l)	Phenols (mg/l)	Cu (mg/l)	Cr (mg/l)
1-26	528	0.14	0.10	$\leq$0.10
1-27	480	0.13	0.12	$\leq$0.10
1-28	404	0.16	0.12	$\leq$0.10
1-29	681	0.62	0.10	$\leq$0.10
1-30	642	2.57	0.12	0.23
1-31	499	10.80	0.08	0.38
2-1	444	2.28	0.08	$\leq$0.10

Date	Zn (mg/l)	Pb (mg/l)	Ni (mg/l)	C[illegible] (mg/l)
1-26	0.29	$\leq$0.39	$\leq$0.11	$\leq$0.03
1-27	0.23	$\leq$0.39	$\leq$0.11	$\leq$0.03
1-28	0.29	$\leq$0.39	$\leq$0.11	$\leq$0.03
1-29	0.27	$\leq$0.39	$\leq$0.11	$\leq$0.03
1-30	0.37	$\leq$0.39	$\leq$0.11	$\leq$0.03
1-31	0.24	$\leq$0.39	$\leq$0.11	$\leq$0.03
2-1	0.18	$\leq$0.39	$\leq$0.11	$\leq$0.03

Appendix K

PRIORITY RATING OF LANGLEY AFB
DISPOSAL SITES

Table K-1
LANGLEY AFB DISPOSAL SITE EVALUATION SUMMARY

Site No.	Site Description	Overall Score	Subscores			
			Receptors	Pathways	Waste Characteristics	Waste Management Practices
1	Possible landfill site	42	46	28	30	68
2	Old wastewater treatment plant site	38	46	28	30	50
3	Possible fuel-saturated area	43	43	31	50	50
4	Possible fuel-saturated area	43	41	31	50	52
5	Past landfill site	47	46	28	50	70
6	Past sludge landfarm	38	46	28	30	50
7	Past landfill site	48	46	28	50	73
8	Old wastewater treatment plant site	38	46	28	30	50
9	Gas cylinder disposal area	38	46	28	30	50
10	Past landfill site	47	39	28	50	73
11	Past landfill site	47	39	28	50	73
12	Recent landfill site	52	43	41	50	78
13	Past small landfill trench	40	43	28	30	63
14	Chemical leach pit	48	39	31	60	67
15	Past salvage vehicle dumping area	41	46	28	30	63
16	Possible fuel-saturated area	44	46	31	50	52
17	Past landfill site	47	46	28	50	67
18	Past landfill site	45	43	28	50	65
19	Existing PCB storage area	43	43	31	50	50
21	Possible fuel-saturated area	43	41	31	50	52
22	Past landfill site	41	46	28	30	65
23	Past coal storage area	36	46	28	30	44
24	New waste oil storage area	40	39	28	50	44
25	Pesticide/herbicide storage area	43	46	31	50	50

Table K-2
PRIORITY LISTING OF LANGLEY AFB DISPOSAL SITES

Site No.	Site Description	Overall Score
	MEDIUM PRIORITY	43 - 52
3	Possible fuel-saturated area	43
4	Possible fuel-saturated area	43
5	Past landfill site	47
7	Past landfill site	48
10	Past landfill site	47
11	Past landfill site	47
12	Recent landfill site	52
14	Chemical leach pit	48
16	Possible fuel-saturated area	44
17	Past landfill site	47
18	Past landfill site	45
19	Existing PCB storage area	43
21	Possible fuel-saturated area	43
25	Pesticide/herbicide storage area	43
	LOW PRIORITY	38 - 42
1	Possible landfill site	42
2	Old wastewater treatment plant site	38
6	Past sludge landfarm	38
8	Old wastewater treatment plant site	38
9	Gas cylinder disposal area	38
13	Past small landfill trench	40
15	Past salvage vehicle dumping area	41
22	Past landfill site	41
23	Past coal storage area	36
24	New waste oil storage area	40

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 1; Possible Landfill Site
Location Langley AFB
Owner/Operator Langley AFB
Comments
Suspected to have been in operation from 1940 to 1954

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

SUBTOTALS 63 138
SUBSCORE 46
(Factor Score Divided by Maximum Score and Multiplied by 100)

PATHWAYS	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

SUBTOTALS 55 195
SUBSCORE 28
(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 1

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:
No hazardous wastes known or suspected.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		2	4	8	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		3	7	21	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0%

SUBTOTALS 102 150

SUBSCORE 68

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8%

OVERALL SCORE 42

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 1; Possible Landfill Site

Location Langley AFB

Owner/Operator Langley AFB

Comments

Suspected to have been in operation from 1940 to 1950

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	63	138
		SUBSCORE		46

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	55	195
		SUBSCORE		28

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site: Nos. 2, 8; Old Wastewater Treatment Plant Sites

Location: Langley AFB

Owner/Operator: Langley AFB

Comments: Abandoned in 1968

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	63	138
		SUBSCORE		46

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	55	195
		SUBSCORE		28

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Sites 2, 8

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:

No hazardous wastes known or suspected.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		NA	6		
Use of Gas Collection Systems		NA	2		
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicaibe Values = 22 %

SUBTOTALS 63 126

SUBSCORE 50

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8 %

OVERALL SCORE 38

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 3; Possible Fuel-Saturated Area

Location Langley AFB

Owner/Operator Langley AFB

Comments

Underground fuel lines abandoned in 1965

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 60 138

SUBSCORE 43

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 60 195

SUBSCORE 31

(Factor Score Divided by Maximum Score and Multiplied by 100)

/

Site 3

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
Suspected fuel-saturated area

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	1	3	3	9
Absence of Liners or Confining Beds		2	6	6	12
Use of Leachate Collection System		NA	6		
Use of Gas Collection Systems		NA	2		
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21

Number of Assumed Values = 2 Out of 9
Percentage of Assumed Values = 22 %
Number of Missing and Non-Applicable Values = 2 Out of 9
Percentage of Missing and Non-Applicalbe Values = 22 %

SUBTOTALS 60 120
SUBSCORE 50
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25
Overall Percentage of Assumed Values = 8 %

OVERALL SCORE 43
(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 4; Possible Fuel-Saturated Area

Location Langley AFB

Owner/Operator Langley AFB

Comments

Underground fuel storage tanks abandoned in 1965.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	57	138
		SUBSCORE		41

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	60	195
		SUBSCORE		31

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 4

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

Suspected fuel-saturated area.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	1	3	3	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		NA	6		
Use of Gas Collection Systems		NA	2		
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicalbe Values = 22%

SUBTOTALS 66 126

SUBSCORE 52

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8%

OVERALL SCORE 43

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 5; Past Landfill Site

Location Langley AFB

Owner/Operator Langley AFB

Comments

In operation during the 1930s and 1940s.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	63	138
		SUBSCORE		46

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBSCORE (Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	55	195
		SUBSCORE		28

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBSCORE (Factor Score Divided by Maximum Score and Multiplied by 100)

Site 5

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

The site may have received small quantities of waste solvents, old battery casings and paint wastes.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	1	7	7	21
Total Waste Quantity		1	4	4	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		3	7	21	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0 %

SUBTOTALS 105 150

SUBSCORE 70

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8 %

OVERALL SCORE 47

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 6; Past Sludge Landfarm

Location Langley AFB

Owner/Operator Langley AFB

Comments

Landspreading of waste sanitary wastewater treatment plant sludge - discontinued after 1968.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBTOTALS 63 138

SUBSCORE 46

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 55 195

SUBSCORE 28

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 6

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:
No hazardous wastes known or suspected.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		NA	6		
Use of Gas Collection Systems		NA	2		
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21

Number of Assumed Values = 2 Out of 9
Percentage of Assumed Values = 22%
Number of Missing and Non-Applicable Values = 2 Out of 9
Percentage of Missing and Non-Applicalbe Values = 22%

SUBTOTALS 63 126
SUBSCORE 50
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25
Overall Percentage of Assumed Values = 8%

OVERALL SCORE 38
(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 7; Past Landfill Site
Location Langley AFB
Owner/Operator Langley AFB
Comments
In operation from the late 1940s until the early 1960s.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

SUBTOTALS 63 138
SUBSCORE 46
(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

SUBTOTALS 55 195
SUBSCORE 28
(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 7

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

The site may have received small quantities of waste solvents, old battery [illegible], and paint wastes.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	1	7	7	21
Total Waste Quantity		2	4	8	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		3	7	21	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0%

SUBTOTALS 109 150

SUBSCORE 73

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8%

OVERALL SCORE 48

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 9; Gas Cylinder Disposal Area

Location

Owner/Operator

Comments

Disposal of empty gas cylinders prior to 1935

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	63	138
		SUBSCORE		46

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	55	195
		SUBSCORE		28

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 9

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:
No hazardous wastes known or suspected.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		NA	6		
Use of Gas Collection Systems		NA	2		
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21

Number of Assumed Values = 2 Out of 9
Percentage of Assumed Values = 22%
Number of Missing and Non-Applicable Values = 2 Out of 9
Percentage of Missing and Non-Applicalbe Values = 22%

SUBTOTALS 63 126
SUBSCORE 50
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25
Overall Percentage of Assumed Values = 8%

OVERALL SCORE 38
(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 10; Past Landfill Site
Location Langley AFB
Owner/Operator Langley AFB
Comments
In operation from 1953 to 1965.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

SUBTOTALS 54 138
SUBSCORE 39
(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

SUBTOTALS 55 195
SUBSCORE 28
(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 10

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

The site may have received small quantities of waste solvents, old battery casings, paint wastes, and waste chemicals from Langley AFB and NASA.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	1	7	7	21
Total Waste Quantity		2	4	8	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		3	7	21	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0 %

SUBTOTALS 109 150

SUBSCORE 73

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assmed Values = 8 %

OVERALL SCORE 47

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 11; Past Landfill Site

Location Langley AFB

Owner/Operator Langley AFB

Comments

In operation from 1965 to 1972

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	54	138
		SUBSCORE		39

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 6 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	55	195
		SUBSCORE		28

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 11

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

The site may have received small quantities of waste solvents, old battery casings, paint wastes and waste chemicals from Langley AFB and NASA.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	1	7	7	21
Total Waste Quantity		2	4	8	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		3	7	21	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0%

SUBTOTALS 109 150

SUBSCORE 73

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8%

OVERALL SCORE 47

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 12; Recent Landfill Site
Location Langley AFB
Owner/Operator Langley AFB
Comments
In operation from 1972 to 1980

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

SUBTOTALS 60 138
SUBSCORE 43
(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	1	10	10	30
Level of Water Contamination	1	15	15	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

SUBTOTALS 80 195
SUBSCORE 41
(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 12

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

The site may have received small quantities of waste solvents, old battery casings, paint wastes, and waste chemicals from Langley AFB and NASA

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	1	7	7	21
Total Waste Quantity		2	4	8	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		3	8	24	24
Subsurface Flows		3	7	21	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0 %

SUBTOTALS 112 150

SUBSCORE 78

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8%

OVERALL SCORE 52

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 13; Past Small Landfill Trench

Location Langley AFB

Owner/Operator Langley AFB

Comments

Used less than 1 month.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	60	138
		SUBSCORE		43

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	55	195
		SUBSCORE		28

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 13

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:
No hazardous wastes known or suspected.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		3	7	21	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0%

SUBTOTALS 94 150

SUBSCORE 63

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assimed Values = 8%

OVERALL SCORE 40

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA SSESSMENT AND RATING FORM

Name of Site No. 14; Chemical Leach Pit

Location Langley AFB

Owner/Operator Langley AFB

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	54	138
		SUBSCORE		35

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

SUBSCORE (Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	60	195
		SUBSCORE		31

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBSCORE (Factor Score Divided by Maximum Score and Multiplied by 100)

Site 14

WASTE CHARACTERISTICS

Hazardous Rating: Judgmental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 60

Reason for Assigned Hazardous Rating:

The pit was used in the past for disposal of waste pesticides.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	1	7	7	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		3	7	21	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0 %

SUBTOTALS 101 150

SUBSCORE 67

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8 %

OVERALL SCORE 48

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 15; Past Salvage Vehicle Dumping Area
Location Langley AFB
Owner/Operator Langley AFB
Comments
In operation during the 1940s.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	63	138
		SUBSCORE		46

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	55	195
		SUBSCORE		28

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

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WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 16; Possible Fuel-Saturated Area

Location Langley AFB

Owner/Operator Langley AFB

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Val .s = 0 %

SUBTOTALS 63 138

SUBSCORE 46

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

SUBTOTALS 60 195

SUBSCORE 31

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 16

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

Suspected fuel-saturated area.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	1	3	3	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		NA	6		
Use of Gas Collection Systems		NA	2		
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicalbe Values = 22%

SUBTOTALS 66 126

SUBSCORE 52

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assimed Values = 8%

OVERALL SCORE 44

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 17; Past Landfill Site
Location Langley AFB
Owner/Operator Langley AFB
Comments
In operation prior to 1945 - also used for trash burning

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	63	138
		SUBSCORE		46

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	55	195
		SUBSCORE		28

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 17

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

The site may have received small quantities of waste solvents, old battery casings, and paint wastes.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	1	7	7	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		3	7	21	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicalbe Values = 0 %

SUBTOTALS 101 150

SUBSCORE 67

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 7 %

OVERALL SCORE 47

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 19; Past Landfill Site
Location Langley AFB
Owner/Operator Langley AFB
Comments
In operation during the 1930's.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

SUBTOTALS 60 138
SUBSCORE 43
(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

SUBTOTALS 55 195
SUBSCORE 28
(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 18

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points

30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

The site may have received small quantities of waste solvents, old battery casings, and paint wastes.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		1	4	4	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		3	7	21	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 0 Out of 9

Percentage of Missing and Non-Applicaibe Values = 0%

SUBTOTALS 98 150

SUBSCORE 65

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8%

OVERALL SCORE 45

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 19; Existing PCB Storage Area

Location Langley AFB

Owner/Operator Langley AFB

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	60	138
		SUBSCORE		43

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	60	195
		SUBSCORE		31

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 19

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

Small PCB spills are suspected from transformers formerly stored outside on gravel base.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		NA	6		
Use of Gas Collection Systems		NA	2		
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicalbe Values = 22%

SUBTOTALS 63 126

SUBSCORE 50

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assimed Values = 8%

OVERALL SCORE 43

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 21; Possible Fuel-Saturated Area
Location Langley AFB
Owner/Operator Langley AFB
Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	57	138
		SUBSCORE		41

Number of Assumed Values = 0 out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 out of 6
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	60	195
		SUBSCORE		31

Number of Assumed Values = 0 out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 out of 10
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 21

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:
Suspected fuel-saturated area

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	1	3	3	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		NA	6		
Use of Gas Collection Systems		NA	2		
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21

Number of Assumed Values = 2 out of 9

Percentage of Assumed Values = 22 %

Number of Missing and Non-Applicable Values = 2 out of 9

Percentage of Missing and Non-Applicalbe Values = 22 %

SUBTOTALS 66 126

SUBSCORE 52

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 out of 25

Overall Percentage of Assumed Values = 8 %

OVERALL SCORE 43

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 22; Past Landfill Site
Location Langley AFB
Owner/Operator Langley AFB
Comments
In operation during the 1930s.

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	63	138
		SUBSCORE		46

Number of Assumed Values = 0 Out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	55	195
		SUBSCORE		28

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 22

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:
No hazardous wastes known or suspected.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		1	4	4	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		3	6	18	18
Use of Gas Collection Systems		3	2	6	6
Site Closure		2	8	16	24
Subsurface Flows		3	7	21	21

Number of Assumed Values = 2 Out of 9
Percentage of Assumed Values = 22%
Number of Missing and Non-Applicable Values = 0 Out of 9
Percentage of Missing and Non-Applicalbe Values = 0%

SUBTOTALS 98 150
SUBSCORE 65
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25
Overall Percentage of Assumed Values = 8%

OVERALL SCORE 41
(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 23; Past Coal Storage Area

Location Langley AFB

Owner/Operator Langley AFB

Comments

Outside storage

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	63	138
		SUBSCORE		46

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	55	195
		SUBSCORE		28

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 23

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 30

Reason for Assigned Hazardous Rating:
No hazardous wastes known or suspected.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	36
Use of Leachate Collection System		NA	6		
Use of Gas Collection Systems		NA	2		
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21

Number of Assumed Values = 2 Out of 9
Percentage of Assumed Values = 22%
Number of Missing and Non-Applicable Values = 2 Out of 9
Percentage of Missing and Non-Applicalbe Values = 22%

SUBTOTALS 63 144
SUBSCORE 44
(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25
Overall Percentage of Assimed Values = 8%

OVERALL SCORE 36
(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site No. 24; New Waste Oil Storage Area
Location Langley AFB
Owner/Operator Langley AFB
Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	2	6	12	18
Land Use/Zoning	2	3	6	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18

Number of Assumed Values = 0 out of 6
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 6
Percentage of Missing Values = 0 %

SUBTOTALS 54 138
SUBSCORE 39
(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	0	5	0	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12

Number of Assumed Values = 0 Out of 10
Percentage of Assumed Values = 0 %
Number of Missing Values = 0 Out of 10
Percentage of Missing Values = 0 %

SUBTOTALS 55 195
SUBSCORE 28
(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 24

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

Suspected small spills of waste oils and solvents.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		2	7	14	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		NA	6		
Use of Gas Collection Systems		NA	2		
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicaibe Values = 22%

SUBTOTALS 56 126

SUBSCORE 44

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8%

OVERALL SCORE 40

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site: No. 25; Pesticide/Herbicide Storage Area

Location: Langley AFB

Owner/Operator: Langley AFB

Comments

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet	0	4	0	12
Distance to Nearest Drinking Water Well	0	15	0	45
Distance to Reservation Boundary	3	6	18	18
Land Use/Zoning	3	3	9	9
Critical Environments	2	12	24	36
Water Quality of Nearby Surface Water Body	2	6	12	18
		SUBTOTALS	63	138
		SUBSCORE		46

Number of Assumed Values = 0 Out of 6

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 6

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination	0	10	0	30
Level of Water Contamination	0	15	0	45
Type of Contamination, Soil/Biota	1	5	5	15
Distance to Nearest Surface Water	3	4	12	12
Depth to Groundwater	3	7	21	21
Net Precipitation	2	6	12	18
Soil Permeability	1	6	6	18
Bedrock Permeability	0	4	0	12
Depth to Bedrock	0	4	0	12
Surface Erosion	1	4	4	12
		SUBTOTALS	60	195
		SUBSCORE		31

Number of Assumed Values = 0 Out of 10

Percentage of Assumed Values = 0 %

Number of Missing Values = 0 Out of 10

Percentage of Missing Values = 0 %

(Factor Score Divided by Maximum Score and Multiplied by 100)

Site 25

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE 50

Reason for Assigned Hazardous Rating:

Suspected small spills of pesticides and herbicides stored outdoors on gravel base.

WASTE MANAGEMENT PRACTICES

RATING FACTOR		FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		3	7	21	21
Hazardous Waste Quantity	Assumed	0	7	0	21
Total Waste Quantity		0	4	0	12
Waste Incompatibility	Assumed	0	3	0	9
Absence of Liners or Confining Beds		2	6	12	18
Use of Leachate Collection System		NA	6		
Use of Gas Collection Systems		NA	2		
Site Closure		2	8	16	24
Subsurface Flows		2	7	14	21

Number of Assumed Values = 2 Out of 9

Percentage of Assumed Values = 22%

Number of Missing and Non-Applicable Values = 2 Out of 9

Percentage of Missing and Non-Applicalbe Values = 22%

SUBTOTALS 63 126

SUBSCORE 50

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = 2 Out of 25

Overall Percentage of Assumed Values = 8%

OVERALL SCORE 43

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

Appendix L

HAZARD EVALUATION METHODOLOGY

ENGINEERING-SCIENCE

RECEIVED
CH2M HILL

JUL 13 1981

MAIL ROOM-GNV

MEMORANDUM

TO: Mr. Bernard Lindenberg, AFESC, Tyndall AFB, FL
Major Gary Fishburn, USAF OEHL, Brooks AFB, TX

FROM: Norman N. Hatch, Jr., CH2M HILL, Gainesville, FL NNH by E/S
Ernest J. Schroeder, Engineering-Science, Atlanta, GA E/S

DATE: July 8, 1981

SUBJECT: Joint Meeting between CH2M HILL and Engineering-Science to develop a uniform site rating system for use in all Air Force Installation Restoration Program Records Search Projects

MEETING LOCATION: CH2M HILL, Gainesville, Florida office

MEETING DATE: Monday, June 29, 1981

A. Introduction and Purpose

A joint meeting was held at the CH2M HILL Gainesville, Florida office on Monday, June 29, 1981. The purpose of the meeting was to develop a uniform site rating system for use in all upcoming Air Force Installation Restoration Program Records Search projects. Attendees at the meeting included:

- Norman N. Hatch, Jr., CH2M HILL Representative
- Ernest J. Schroeder, Engineering-Science Representative
- Major Gary Fishburn, Air Force Observer

The basis for the rating system is the document developed by JRB Associates, Inc., McLean, Virginia, for the EPA Hazardous Waste Enforcement Office, Washington, D.C. The above document presents a methodology for selecting sites for investigation based on their potential for adverse environmental impact. Careful scrutiny of this document by CH2M HILL and Engineering-Science indicated that the rating system could readily be used, with some modifications, for evaluating Air Force installation sites.

These modifications would be necessary for the following reasons:

1. The methodology presented in the JRB document was developed primarily for large landfill operations throughout the nation. Modifications are necessary to accurately address specific Air Force installation conditions.

2. The rating system must include an equivalent comparison of landfill sites and suspected contaminated sites other than landfills, e.g., PCB spills.

B. Modifications to the JRB Rating System

The specific modifications jointly developed by CH2M HILL and Engineering-Science, based on experience in performing Record Searches at several Air Force installations, are presented in the revised JRB rating form and rating factor system (attached). The modifications, in general, are summarized below:

1. Changes in multipliers for several of the rating factors in the receptors, pathways, and waste management practices categories.

2. Deletion of several existing rating factors and addition of new rating factors in the receptors, pathways, and waste management practices categories.

3. Revision of the waste characteristics category.

4. Special considerations in the use of the waste management practices category to provide meaningful comparison of landfills and contaminated areas other than landfills. These special considerations include:

    a. Use of all nine rating factors for the evaluation of landfills.

    b. Deletion of non-applicable rating factors when evaluating other contaminated areas. The category score is then normalized to provide an equivalent comparison with landfills.

CONCLUSION

All parties present at the meeting agreed that the above modifications would provide a meaningful rating system for Air Force installation sites. The system will be used in the next several Record Searches and then re-evaluated to determine if further modifications are necessary.

NNH/EJS/lmr

WASTE DISPOSAL SITE AND SPILL AREA ASSESSMENT AND RATING FORM

Name of Site ____________________

Location ____________________

Owner/Operator ____________________

Comments ____________________

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
RECEPTORS				
Population Within 1,000 Feet		4		
Distance to Nearest Drinking Water Well		15		
Distance to Reservation Boundary		6		
Land Use/Zoning		3		
Critical Environments		12		
Water Quality of Nearby Surface Water Body		6		

Number of Assumed Values = _____ Out of 6

Percentage of Assumed Values = _____%

Number of Missing Values = ____ Out of 6

Percentage of Missing Values = ____%

SUBTOTALS ________ ______

SUBSCORE ______

(Factor Score Divided by Maximum Score and Multiplied by 100)

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
PATHWAYS				
Evidence of Water Contamination		10		
Level of Water Contamination		15		
Type of Contamination, Soil/Biota		5		
Distance to Nearest Surface Water		4		
Depth to Groundwater		7		
Net Precipitation		6		
Soil Permeability		6		
Bedrock Permeability		4		
Depth to Bedrock		4		
Surface Erosion		4		

Number of Assumed Values = ____ Out of 10

Percentage of Assumed Values = ____ %

Number of Missing Values = ____ Out of 10

Percentage of Missing Values = ____%

SUBTOTALS ________ ______

SUBSCORE ______

(Factor Score Divided by Maximum Score and Multiplied by 100)

WASTE CHARACTERISTICS

Hazardous Rating: Judgemental rating from 30 to 100 points based on the following guidelines:

Points	
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantites of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

SUBSCORE ______

Reason for Assigned Hazardous Rating:

______

______

______

WASTE MANAGEMENT PRACTICES

RATING FACTOR	FACTOR RATING (0-3)	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
Record Accuracy and Ease of Access to Site		7		
Hazardous Waste Quantity		7		
Total Waste Quantity		4		
Waste Incompatibility		3		
Absence of Liners or Confining Beds		6		
Use of Leachate Collection System		6		
Use of Gas Collection Systems		2		
Site Closure		8		
Subsurface Flows		7		

Number of Assumed Values = ____ Out of 9

Percentage of Assumed Values = ____%

Number of Missing and Non-Applicable Values = ____ Out of 9

Percentage of Missing and Non-Applicalbe Values = ____%

SUBTOTALS ______ ______

SUBSCORE ______

(Factor Score Divided by Maximum Score and Multiplied by 100)

Overall Number of Assumed Values = ____ Out of 25

Overall Percentage of Assumed Values = ____%

OVERALL SCORE ______

(Receptors Subscore X 0.22 plus
Pathways Subscore X 0.30 plus
Waste Characteristics Subscore X 0.24 plus
Waste Management Subscore X 0.24)

RATING FACTOR SYSTEM GUIDELINES

RATING FACTORS	RATING SCALE LEVELS 0	1	2	3
RECEPTORS				
Population Within 1,000 Feet	0	1 to 25	26 to 100	Greater than 100
Distance to Nearest Drinking Water Well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet
Distance to Reservation Boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet
Land Use/Zoning	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential
Critical Environments	Not a critical environment	Pristine natural areas	Wetlands, floodplains, and preserved areas; presence of economically important natural resources	Major habitat of an endangered or threatened species; presence of recharge area
Water Quality Designation of Nearest Surface Water Body	Agricultural or industrial use	Recreation, propagation and management of fish & wildlife	Shellfish propagation and harvesting	Potable water supplies
PATHWAYS				
Evidence of Water Contamination	No contamination	Indirect evidence	Positive proof from direct observation	Positive proof from laboratory analyses
Level of Water Contamination	No contamination	Low levels, trace levels, or levels less than maximum contaminant level (MCL) or EPA drinking water standards	Moderate levels or levels near MCL or EPA drinking water standards	High levels greater than MCL or EPA drinking water standards
Type of Contamination - Soil/Biota	No contamination	Suspected contamination	Moderate contamination	Severe contamination
Distance to Nearest Surface Water	Greater than 1 mile	2,001 ft to 1 mile	501 ft. to 2,000 ft.	0 to 500 ft.
Depth to Groundwater	Greater than 500 ft.	51 to 500 ft.	11 to 50 ft.	0 to 10 ft.
Net Precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.
Soil Permeability	Greater than 50% clay ($<10^{-6}$ cm/s)	30% to 50% clay (10^{-4} to 10^{-6} cm/s)	15% to 30% clay (10^{-2} to 10^{-4} cm/s)	0 to 15% clay ($>10^{-2}$ cm/s)
Bedrock Permeability	Impermeable ($<10^{-6}$ cm/s)	Relatively impermeable (10^{-4} to 10^{-6} cm/s)	Relatively permeable (10^{-2} to 10^{-4} cm/s)	Very permeable ($>10^{-2}$ cm/s)
Surface Erosion	None	Slight	Moderate	Severe

WASTE CHARACTERISTICS

Judgmental hazardous rating from 30 to 100 points based on the following guidelines:

Points	Condition
30	Closed domestic-type landfill, old site, no known hazardous wastes
40	Closed domestic-type landfill, recent site, no known hazardous wastes
50	Suspected small quantities of hazardous wastes
60	Known small quantities of hazardous wastes
70	Suspected moderate quantities of hazardous wastes
80	Known moderate quantities of hazardous wastes
90	Suspected large quantities of hazardous wastes
100	Known large quantities of hazardous wastes

RATING FACTORS	RATING SCALE LEVELS 0	1	2	3
	WASTE MANAGEMENT PRACTICES			
Record Accuracy and Ease of Access to Site	Accurate records, no unauthorized dumping	Accurate records, no barriers	Incomplete records, no barriers	No records, no barriers
Hazardous Waste Quantity	<1 ton	1 to 5 tons	5 to 20 tons	>20 tons
Total Waste Quantity	0 to 10 acre ft.	11 to 100 acre ft.	101 to 250 acre ft.	Greater than 250 acre ft.
Waste Incompatibility	No incompatible wastes are present	Present, but does not pose a hazard	Present and may pose a future hazard	Present and posing an immediate hazard
Absence of Liners or Confining Strata	Liner and confining strata	Liner or confining strata	Low quality liner or low permeability strata	No liner, no confining strata
Use of Leachate Collection Systems	Adequate collection and treatment	Inadequate collection or treatment	Inadequate collection and treatment	No collection or treatment
Use of Gas Collection Systems	Adequate collection and treatment	Collection and controlled flaring	Venting or inadequate treatment	No collection or treatment
Site Closure	Impermeable cover	Low permeability cover	Permeable cover	Abandoned site, no cover
Subsurface Flows	Bottom of landfill greater than 5 ft. above high groundwater level	Bottom of landfill occasionally submerged	Bottom of fill frequently submerged	Bottom of fill located below mean groundwater level

JRB RATING SYSTEM
INTRODUCTION AND METHODOLOGY

Source:

"Methodology for Rating the Hazard Potential of Waste Disposal Sites," JRB Associates, Inc., December 15, 1980

CHAPTER 1.0 INTRODUCTION

As part of EPA's nationwide waste management program, land disposal facilities containing hazardous wastes will be investigated and evaluated. Remedial action plans will be formulated for those sites presenting a significant hazard. Because resources for this task are limited, the initial focus of the work must be on the most hazardous sites. Under the auspices of EPA's Office of Enforcement, JRB Associates has devised a methodology for selecting sites for investigation based on their high potential for environmental impact.

This methodology has several advantages over other rating systems:

- It is easy to use
- It does not require users to have an extensive technical background
- It uses readily available information
- It does not require complex chemical or hydrological analyses
- It does not require users to visit the facilities in question
- It allows sites to be rated even if some data needs cannot be met.

The system consists of 31 rating factors that are divided into 4 categories: receptors; pathways; waste characteristics; and waste management practices. Factors in the receptors category determine the prime targets of environmental contamination. Factors in the pathways category assess mechanisms for contaminant migration. Factors in the waste characteristics category examine the types of hazards posed by contaminants in the site. Factors in the waste management practices category evaluate the quality of the facility's design and operation. Each rating factor has an associated four-level scale. Because all of these factors are not of equal importance, each also has been assigned a weighing factor, called a multiplier. Raters must simply decide

which level of the rating factor's scale is most appropriate for a given site and multiply the numeric value of that level by the corresponding multiplier. The sum of the products for the 31 factors divided by the maximum possible score and multiplied by 100 is the site's rating. The ratings are on a scale of 0 to 100 and can be interpreted in relative or absolute terms.

Users can assign additional points when the rating factors do not adequately address all of the problems of a site. However, only a limited number of additional points can be assigned. This arrangement helps to ensure that a site's rating is both complete and objective.

The methodology has been designed primarily for landfills, surface impoundments, and other types of land-based storage and disposal facilities. Incinerators and waste treatment facilities, however, are beyond scope with the exception of the solid wastes produced by them.

Site ratings should be performed as part of an overall investigation procedure. Prior to a site visit, ratings can be based on published materials, public and private records, and contacts with knowledgable parties. The results of this type of rating can be used to determine which sites present the greatest potential hazard and should be visited first. A final rating can be obtained with information obtained from a visit to a site. This rating can be used as a tool to help determine how limited resources should be spent for additional sampling, which may be required to fill data gaps, and for preparing remedial action plans and/or enforcement cases for sites that represent particularly severe hazards.

The methodology's validity has been tested at sites across the country. This testing includes comparing ratings completed for the same facilities both by different raters, and before and after site visits. Officials of New Jersey's Department of Environmental Protection agreed that the ratings on 30 sites in their state were good reflections of the true hazard potential of those sites. These results show that the methodology is an exceptionally useful and efficient tool for classifying and ranking the hazard potential of land disposal facilities.

The methodology is discussed in more detail in the following four chapters. Chapter 2 describes the six basic components of the methodology. Chapter 3 identifies sources of information for the system and describes how to resolve data gaps. Chapter 4 presents the step-by-step procedure for rating sites, and Chapter 5 discusses how site ratings can be used. The three appendices provide guidance for rating sites. Finally, the glossary located at the end of this document defines all terms related to the methodology.

CHAPTER 2.0 DESCRIPTION OF THE METHODOLOGY

The site rating methodology has been developed in terms of six elements. These are:

- Factor categories
- Rating factors
- Rating scales
- Multipliers
- Additional points
- Hazard potential scores.

These elements are described below.

2.1 FACTOR CATEGORIES

In assessing the environmental impacts of any hazardous waste disposal site, four considerations must be addressed. These are:

- Receptors
- Pathways
- Waste characteristics
- Waste management practices.

Receptors refer to the biota (human and non-human) which are potentially affected by the materials released from a waste disposal site. Within this category, special attention is given to human populations and critical environments. Pathways refer to aspects of the routes by which hazardous materials can escape from a given site. The focus of this cateory is on the ease of migration of water soluble pollutants and on contamination due to the site. Waste characteristics refer to the types of hazards posed by materials in the facility in terms of both their health-related effects and their environmental mobility. Waste management practices refer to the design characteristics and management practices of a given disposal site as they

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relate to the site's environmental impact. In particular, this category examines measures that are being taken to minimize exposure to hazardous wastes.

The prime importance of the factor categories is in partitioning the rating factors into manageable groups so that site ratings can be more easily and completely interpreted. This topic is discussed in greater detail in Chapter 5.

2.2 RATING FACTORS

The initial rating of a waste disposal facility is based on a set of 31 rating factors. Each of these has been assigned to one of the four factor categories. The receptors catgegory has five rating factors:

- "Residential population within 1,000 feet" and "Distance to the nearest off-site building" measure the potential for human exposure to the site
- "Distance to the nearest drinking-water well" measures the potential for human ingestion of contaminants should underlying aquifers be polluted
- "Land use/zoning" evaluates the current and anticipated uses of the surrounding area
- "Critical environments" assesses the potential for adversely affecting important biological resources and fragile natural settings.

The pathways category contains nine rating factors concerned with the potential migration and attenuation of contaminants. The primary focus is on waterborne pollutants, since they can affect the greatest number of people.

- "Distance to the nearest surface water" and "Depth to groundwater" measure the availability of pollutant migration routes
- "Soil permeability," "bedrock permeability," and "depth to bedrock" measure the potential for contaminant attenuation and ease of migration

- "Net precipitation" uses annual precipitation and evapotranspiration to estimate the amount of leachate a site produces

- "Evidence of contamination," "type of contamination," and "level of contamination" evaluate pollution currently apparent at the site.

The waste characteristics category contains rating factors which examine the waste's environmental mobility and the adverse effects it can cause.

- "Solubility," "volatility," and "physical state" measure the extent to which mobile wastes can leave the site

- "Toxicity," "radioactivity," and "persistence" assess the site's potential to cause health-related injuries

- "Ignitability," "reactivity," and "corrosiveness" evaluate the possibility of fire, explosion, or similar emergencies.

The waste management practices factor category evaluates site design and operation. This category includes eight rating factors:

- "Use of leachate collection systems," "use of gas collection systems," and "use of liners" examine features of site design for containing contamination

- "Site security" assesses the measures taken to limit site access

- "Total waste quantity" and "hazardous waste quantity" measure the quantity of waste in the site, and thus, the potential magnitude of resulting contamination

- "Waste incompatibility" evaluates the potential for incompatible wastes to combine and pose a hazard

- "Use of containers" assesses the adequacy of using containers to isolate wastes.

These factors have been selected because they are relevant to an evaluation of any land-based disposal facility. The definition and purpose of each rating factor appear in Appendix A.

2.3 RATING SCALES

For each of the factors, a four-level rating scale has been developed which provides factor-specific levels ranging from "0" (indicating no potential hazard) to "3" (indicating a high potential hazard). The rating factors and their corresponding rating scales for each of the factor categories are listed in Table 1. These scales have been defined so that the rating factors typically can be evaluated on the basis of readily available information from published materials, public and private records, contacts with knowledgeable parties, or site visits. Raters compare the information collected for a site with the limits set in the scales, and see which level of each scale most closely fits the information. The numeric value of that level is the factor rating for that factor. This process is described in more detail in Chapter 4. Additional guidance for assessing the rating scales appears in Appendix A.

2.4 MULTIPLIERS

The rating factors do not all assess the same magnitude of potential environmental impact. Consequently, a numerical value called a multiplier has been assigned to each factor in accordance with the relative magnitude of impact that it does assess. These values are multiplied, hence the term multiplier, by the appropriate factor ratings (see Section 2.3) to result in factor scores for each of the rating factors. The 31 multipliers appear as the third column from the right on the methodology's two-page Rating Form (see Figure 3).

2.5 ADDITIONAL POINTS

Special features of a facility's location, design, or operation are frequently encountered that cannot be handled satisfactorily by rating factors alone. These features might present hazards that are unusually serious, unique to the site, or not assessable by rating scales. For example, an extremely high population density near a site should be considered even more hazardous than the rating factor for "population within 1,000 feet" indicates.

Power lines running through sites containing explosive or flammable wastes, though not generally typical of waste disposal sites, should be considered a potential hazard. Finally, the function of the nearest off-site building might indicate a serious threat of human exposure exists, even though types of functions cannot be quantitatively evaluated by rating scales the way distance can be. In such cases, raters should assign a greater hazard potential score to a site than it might otherwise receive by using the additional points system. To guide raters as to the types of situations that might warrant additional points, several examples have been identified for each of the factor categories. These are:

RECEPTORS

- Use of site by local residents
- Neighboring land use
- Neighboring transportation routes, drinking water supplies, and important natural resources.

PATHWAYS

- Extreme runoff and erosion problems
- Slope instability
- Flooding
- Seismic activity.

WASTE CHARACTERISTICS

- Carcinogenicity, mutagenicity, and teratogenicity
- Infectiousness
- Low biodegradability
- High-level radioactivity.

WASTE MANAGEMENT PRACTICES

- Excessively large waste quantities
- Open burning of wastes
- Site abandonment
- Unsafe disposal practices
- Inadequate cover
- Inadequate safety precautions
- Inadequate recordkeeping.

Table 1. Rating Factors and Scales for Each of the Four Factor Categories (Continued)

RATING FACTORS	RATING SCALE LEVELS			
	0	1	2	3
RECEPTORS				
POPULATION WITHIN 1,000 FEET	0	1 TO 25	26 TO 100	GREATER THAN 100
DISTANCE TO NEAREST DRINKING-WATER WELL	GREATER THAN 3 MILES	1 TO 3 MILES	3,001 FEET TO 1 MILE	0 TO 3,000 FEET
DISTANCE TO NEAREST OFF-SITE BUILDING	GREATER THAN 2 MILES	1 TO 2 MILES	1,001 FEET TO 1 MILE	0 TO 1,000 FEET
LAND USE-ZONING	COMPLETELY REMOTE (ZONING NOT APPLICABLE)	AGRICULTURAL	COMMERCIAL OR INDUSTRIAL	RESIDENTIAL
CRITICAL ENVIRONMENTS	NOT A CRITICAL ENVIRONMENT	PRISTINE NATURAL AREAS	WETLANDS, FLOODPLAINS, AND PRESERVED AREAS	MAJOR HABITAT OF AN ENDANGERED OR THREATENED SPECIES
PATHWAYS				
EVIDENCE OF CONTAMINATION	NO CONTAMINATION	INDIRECT EVIDENCE	POSITIVE PROOF FROM DIRECT OBSERVATION	POSITIVE PROOF FROM LABORATORY ANALYSES
LEVEL OF CONTAMINATION	NO CONTAMINATION	LOW LEVELS, TRACE LEVELS, OR UNKNOWN LEVELS	MODERATE LEVELS OR LEVELS THAT CANNOT BE SENSED DURING A SITE VISIT BUT WHICH CAN BE CONFIRMED BY A LABORATORY ANALYSIS	HIGH LEVELS OR LEVELS THAT CAN BE SENSED EASILY BY INVESTIGATORS DURING A SITE VISIT
TYPE OF CONTAMINATION	NO CONTAMINATION	SOIL CONTAMINATION ONLY	BIOTA CONTAMINATION	AIR, WATER, OR FOODSTUFF CONTAMINATION
DISTANCE TO NEAREST SURFACE WATER	GREATER THAN 5 MILES	1 TO 5 MILES	1,001 FEET TO 1 MILE	0 TO 1,000 FEET
DEPTH TO GROUNDWATER	GREATER THAN 100 FEET	51 TO 100 FEET	21 TO 50 FEET	0 TO 20 FEET
NET PRECIPITATION	LESS THAN -10 INCHES	-10 TO +5 INCHES	+5 TO +20 INCHES	GREATER THAN +20 INCHES
SOIL PERMEABILITY	GREATER THAN 50% CLAY	30% TO 50% CLAY	15% TO 30% CLAY	0 TO 15% CLAY
BEDROCK PERMEABILITY	IMPERMEABLE	RELATIVELY IMPERMEABLE	RELATIVELY PERMEABLE	VERY PERMEABLE
DEPTH TO BEDROCK	GREATER THAN 60 FEET	31 TO 60 FEET	11 TO 30 FEET	0 TO 10 FEET

T [illegible] 1. [illegible] Factors and Scales for Each of the Four Factor Categories

RATING FACTORS	RATING SCALE LEVELS			
	0	1	2	3
WASTE CHARACTERISTICS				
TOXICITY	SAX'S LEVEL 0 OR NFPA'S LEVEL 0	SAX'S LEVEL 1 OR NFPA'S LEVEL 1	SAX'S LEVEL 2 OR NFPA'S LEVEL 2	SAX'S LEVEL 3 OR NFPA'S LEVELS 3 OR 4
RADIOACTIVITY	AT OR BELOW BACK-GROUND LEVELS	1 TO 3 TIMES BACK-GROUND LEVELS	3 TO 5 TIMES BACK-GROUND LEVELS	OVER 5 TIMES BACK-GROUND LEVELS
PERSISTENCE	EASILY BIODEGRAD-ABLE COMPOUNDS	STRAIGHT CHAIN HYDROCARBONS	SUBSTITUTED AND OTHER RING COM-POUNDS	METALS, POLYCYCLIC COMPOUNDS, AND HALOGENATED HYDROCARBONS
IGNITABILITY	FLASH POINT GREATER THAN 200° OR NFPA'S LEVEL 0	FLASH POINT OF 140°F. to 200°F. OR NFPA'S LEVEL 1	FLASH POINT OF 80°F. TO 140°F. OR NFPA'S LEVEL 2	FLASH POINT LESS THAN 80°F. OR NFPA'S LEVELS 3 OR 4
REACTIVITY	NFPA'S LEVEL 0	NFPA'S LEVEL 1	NFPA'S LEVEL 2	NFPA'S LEVELS 3 OR 4
CORROSIVENESS	pH OF 6 TO 9	pH OF 5 TO 6 OR 9 TO 10	pH OF 3 TO 5 OR 10 TO 12	pH OF 1 TO 3 OR 12 TO 14
SOLUBILITY	INSOLUBLE	SLIGHTLY SOLUBLE	SOLUBLE	VERY SOLUBLE
VOLATILITY	VAPOR PRESSURE LESS THAN 0.1 mm Hg	VAPOR PRESSURE OF 0.1 TO 25 mm Hg	VAPOR PRESSURE OF 78 TO 25 mm Hg	VAPOR PRESSURE GREATER THAN 78 mm Hg
PHYSICAL STATE	SOLID	SLUDGE	LIQUID	GAS
WASTE MANAGEMENT PRACTICES				
SITE SECURITY	SECURE FENCE WITH LOCK	SECURITY GUARD BUT NO FENCE	REMOTE LOCATION OR BREACHABLE FENCE	NO BARRIERS
HAZARDOUS WASTE QUANTITY	0 TO 250 TONS	251 TO 1,000 TONS	1,001 TO 2000 TONS	GREATER THAN 2,000 TONS
TOTAL WASTE QUANTITY	0 TO 10 ACRE FEET	11 TO 100 ACRE FEET	101 TO 250 ACRE FEET	GREATER THAN 250 ACRE FEET
WASTE INCOMPATIBILITY	NO INCOMPATIBLE WASTES ARE PRESENT	PRESENT, BUT DOES NOT POSE A HAZARD	PRESENT AND MAY POSE A FUTURE HAZARD	PRESENT AND POSING AN IMMEDIATE HAZARD
USE OF LINERS	CLAY OR OTHER LINER RESISTENT TO ORGANIC COMPOUNDS	SYNTHETIC OR CON CRETE LINER	ASPHALT BASE LINER	NO LINER USED
USE OF LEACHATE COLLECTION SYSTEMS	ADEQUATE COLLEC TION AND TREATMENT	INADEQUATE COLLEC TION OR TREATMENT	INADEQUATE COLLEC TION AND TREATMENT	NO COLLECTION OR TREATMENT
USE OF GAS COLLECTION SYSTEMS	ADEQUATE COLLEC TION AND TREATMENT	COLLECTION AND CONTROLLED FLARING	VENTING OR INADE QUATE TREATMENT	NO COLLECTION OR TREATMENT
USE AND CONDITION OF CONTAINERS	CONTAINERS ARE USED AND APPEAR TO BE IN GOOD CONDITION	CONTAINERS ARE USED BUT A FEW ARE LEAKING	CONTAINERS ARE USED BUT MANY ARE LEAKING	NO CONTAINERS ARE USED

While this list is by no means exhaustive, and other examples may be encountered by raters using the methodology, it does include the more commonly occurring situations. Appendix B provides guidance on the number of additional points that should be assigned for these situations.

In order to maintain the objectivity of the rating methodology while allowing the assignment of additional points, the following limits are placed on the number of additional points that may be assigned in each factor category:

• Receptors	50 points
• Pathways	25 points
• Waste characteristics	20 points
• Waste management practices	30 points.

The number of additional points allowed in each factor category is a function of the total available rating factor points and the relative importance of the category.

The actual procedure for assigning additional points is outlined in Chapter 4.

2.6 HAZARD POTENTIAL SCORES

The result of a site rating is a set of five hazard potential scores. These scores are:

- Overall score
- Receptors subscore
- Pathways subscore
- Waste characteristics subscore
- Waste management practices subscore.

The overall score is based on all the rating factors and additional points that are used to rate a site. Each subscore is based on those rating factors

and additional points in that factor category which are used to rate a site. All of these scores are normalized so that they are on a scale of 0 to 100. The normalization procedure is described in Chapter 4. Associated with every hazard potential score is a percentage of missing and assumed data. These percentages flag scores that are based on large amounts of missing data and, generally, measure the reliability of the scores. Chapter 5 describes how to interpret these scores.

INSTALLATION RESTORATION PROGRAM RECORDS SEARCH

HAZARD ASSESSMENT RATING METHODOLOGY FOR LANGLEY AIR FORCE BASE, VIRGINIA

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Appendix K
NEW HAZARDOUS ASSESSMENT RATING METHODOLOGY

USAF INSTALLATION RESTORATION PROGRAM

HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1). The site rating form is provided in Figure 2 and the rating factor guidelines are provided in Table 1.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste managment practices category factor to the sum of the scores for the other three categories.

FIGURE 1

SITE RATING METHODOLOGY FLOW CHART

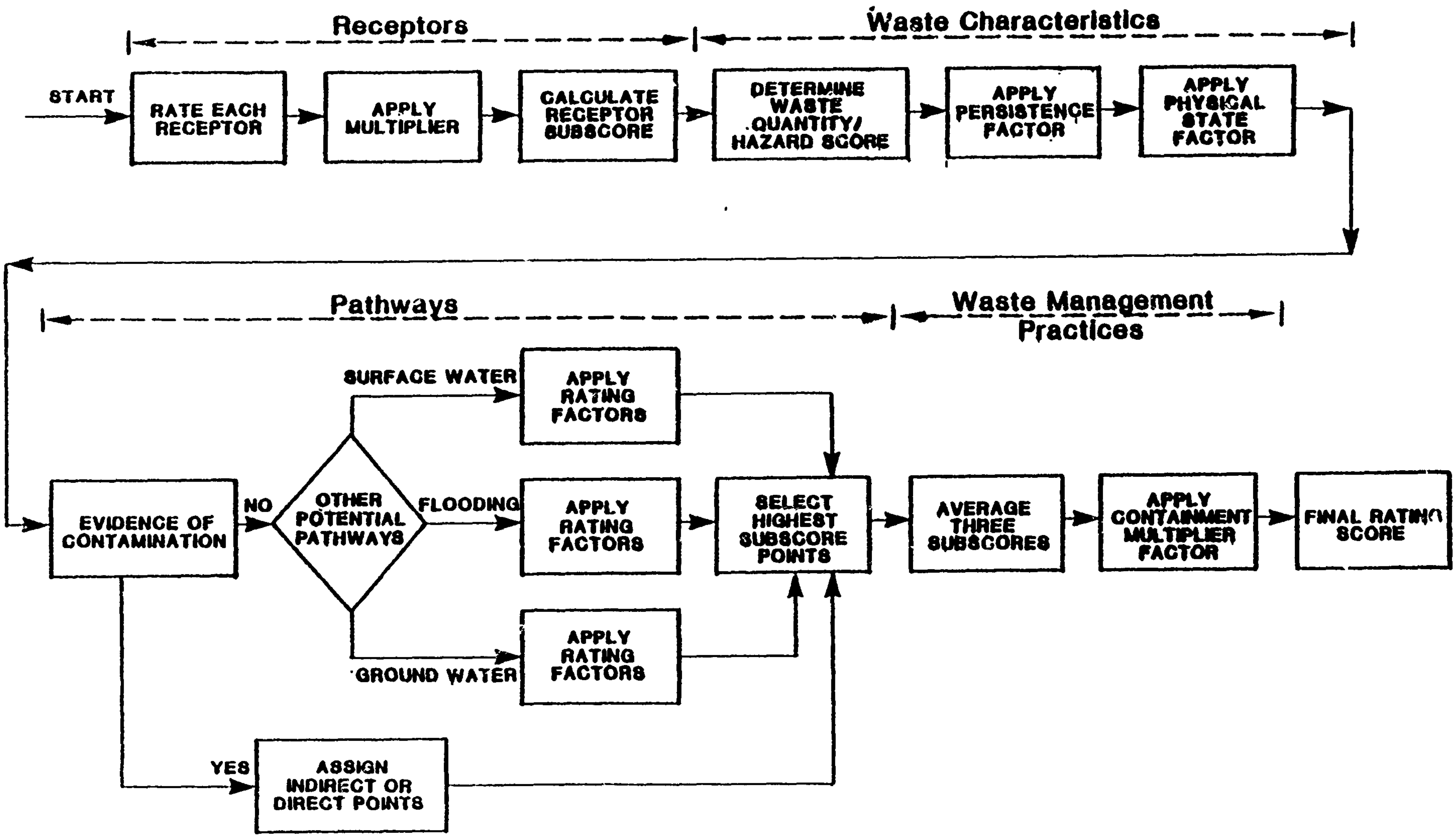

FIGURE 2

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ______________________________

LOCATION ______________________________

DATE OF OPERATION OR OCCURRENCE ______________________________

OWNER/OPERATOR ______________________________

COMMENTS/DESCRIPTION ______________________________

SITE RATED BY ______________________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
		Subtotals	______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
		Subtotals	______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = [ ]

TABLE 1

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplie
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	3
D. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 mi'es downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	M
	L	C	L
	M	S	H
	S	C	H
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be adde' using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsidence fissures,	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES (Cont'd)

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Proection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

Appendix L
NEW SITE RATING FORMS

Table 1

SUMMARY OF RESULTS OF SITE ASSESSMENTS

Site No.	Site Description	Subscores (% of Maximum Possible Score in Each Category) Receptors	Pathways	Waste Characteristics	Overall Score (Sum of Subscores/3)
3	Possible Fuel-Saturated Area	33	67	32	44
4	Possible Fuel-Saturated Area	35	67	32	45
5	Past Sanitary Landfill Site	35	76	40	50
7	Past Sanitary Landfill Site	35	76	40	50
10	Past Sanitary Landfill Site	28	76	40	48
11	Past Sanitary Landfill Site	28	76	40	48
12	Recent Sanitary Landfill Site	31	76	40	49
14	Chemical Leach Pit	28	76	60	55
16	Old Fuel Storage Area	35	67	32	45
17	Past Trash Burning and Landfill Site	35	76	40	50
18	Past Landfill Site	31	76	40	49
19	Existing PCB Storage Area	33	67	40	47
21	Possible Fuel-Saturated Area	32	67	32	44
24	New Waste Oil Storage Area	28	67	40	45
25	Pesticide Storage Area	35	67	40	47

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 3, Possible Fuel-saturated Area

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: Underground fuel line abandoned in 1965

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	60	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 33

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 0.8 = 32

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

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III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	6	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
		Subscore (100 x factor score/3)		30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to ground water	N/A	8	--	--
		Subtotals	60	90
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	33
Waste Characteristics	32
Pathways	67
Total 132 divided by 3 =	44
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

44 x 1.0 44

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 4, Possible Fuel-saturated Area

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: Underground fuel line abandoned in 1965

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	18	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	63	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 35

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 0.8 = 32

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to ground water	N/A	8	--	--
		Subtotals	60	90
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	35
Waste Characteristics	32
Pathways	67
Total 134 divided by 3 =	45
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

45 x 1.0 = 45

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 5, Past Sanitary Landfill Site

LOCATION: Lnagley AFB

DATE OF OPERATION OR OCCURRENCE: 1930's and 1940's

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: May have received small quantities of waste solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	0	10	0	·0
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	63	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 35

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				30
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	3	8	24	24
Direct access to ground water	N/A	8	--	--
		Subtotals	68	90
Subscore (100 x factor score subtotal/maximum score subtotal)				76

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 76

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	35
Waste Characteristics	40
Pathways	76
Total 151 divided by 3 =	50
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

50 x 1.0 50

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 7, Past Sanitary Landfill Site

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: Late 1940's to early 1960's

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: May have received small quantities of waste solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	63	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 35

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	3	8	24	24
Direct access to ground water	N/A	8	--	--
		Subtotals	68	90
Subscore (100 x factor score subtotal/maximum score subtotal)				76

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 76

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	35
Waste Characteristics	40
Pathways	76
Total 151 divided by 3 =	50
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

50 x 1.0 50

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 10, Past Sanitary Landfill Site

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: 1953 to 1965

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: May have received small quantitites of waste solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	50	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 28

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	3	8	24	24
Direct access to ground water	N/A	8	--	--
		Subtotals	68	90
Subscore (100 x factor score subtotal/maximum score subtotal)				76

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 76

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	28
Waste Characteristics	40
Pathways	76
Total 144 divided by 3 =	48
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

48 x 1.0 = 48

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 11, Past Sanitary Landfill Site

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: 1965 to 1972

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: May have received small quantities of waste solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	50	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 28

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	3	8	24	24
Direct access to ground water	N/A	8	--	--
		Subtotals	68	90
Subscore (100 x factor score subtotal/maximum score subtotal)				76

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 76

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	28
Waste Characteristics	40
Pathways	76
Total 144 divided by 3 =	48
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

48 x 1.0 = 48

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 12, Recent Sanitary Landfill Site

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: 1972 to 1980

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: May have received small quantities of waste solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	56	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 31

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
		Subscore (100 x factor score/3)		30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	3	8	24	24
Direct access to ground water	N/A	8	--	--
		Subtotals	68	90
Subscore (100 x factor score subtotal/maximum score subtotal)				76

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 76

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	31
Waste Characteristics	40
Pathways	76
Total 147 divided by 3 =	49
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

49 x 1.0 = 49

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 14, Chemical Leach Pit

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: Use for collection of pesticide washdown and spills

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	50	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 28

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) C

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 60

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

60 x 1.0 = 60

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

60 x 1.0 = 60

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	3	8	24	24
Direct access to ground water	N/A	8	--	--
		Subtotals	68	90
Subscore (100 x factor score subtotal/maximum score subtotal)				76

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 76

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	28
Waste Characteristics	60
Pathways	76
Total 164 divided by 3 =	55
	Gross Total Scc

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

55 x 1.0 = 55

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 16, Old Fuel Storage Aroa

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: Possible fuel-saturated area

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximu Possib Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	63	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 35

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 0.8 = 32

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to ground water	N/A	8	--	--
		Subtotals	60	90
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	35
Waste Characteristics	32
Pathways	67
Total 134 divided by 3 =	45
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

45 x 1.0 = 45

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 17, Past Trash Burning and Landfill Site

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: Prior to 1945

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: May have received small quantities of waste solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	63	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 35

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	3	8	24	24
Direct access to ground water	N/A	8	--	--
		Subtotals	68	90
Subscore (100 x factor score subtotal/maximum score subtotal)				76

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 76

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	35
Waste Characteristics	40
Pathways	76
Total 151 divided by 3 =	50
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

50 x 1.0 = 50

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 18, Past Landfill Site

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: 1930's

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: May have received small quantities of waste solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	56	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 31

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	3	8	24	24
Direct access to ground water	N/A	8	--	--
		Subtotals	68	90
Subscore (100 x factor score subtotal/maximum score subtotal)				76

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 76

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	31
Waste Characteristics	40
Pathways	76
Total 147 divided by 3 =	49
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

49 x 1.0 = 49

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 19, Existing PCB Storage Area

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: Prior to 1979

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: Suspect PCB's--leaking out-of-service transformers

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possibl Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	60	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 33

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.				
			Subscore	--
B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.				
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to ground water	N/A	8	--	--
		Subtotals	60	90
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	33
Waste Characteristics	40
Pathways	67
Total 140 divided by 3 =	47
	Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

47 x 1.0 = 47

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 21, Possible Fuel-saturated Area

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: --

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	57	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 32

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S

2. Confidence level (C = confirmed, S = suspected) S

3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 0.8 = 32

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

32 x 1.0 = 32

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to ground water	N/A	8	--	--
		Subtotals	60	90
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	32
Waste Characteristics	32
Pathways	67
Total 131 divided by 3 =	44
	Gross Total Sco

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

44 x 1.0 = 44

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
		Subscore (100 x factor score/3)		30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to ground water	N/A	8	--	--
		Subtotals	60	90
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	28
Waste Characteristics	40
Pathways	67
Total 135 divided by 3 =	45

Gross Total Sc

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

45 x 1.0 = 45

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 24, New Waste Oil Storage Area

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: Suspect small spills of waste oils and solvents

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	0	4	0	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	2	3	6	9
D.	Distance to reservation boundary	2	6	12	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	50	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) 28

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = 40

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE: No. 25, Pesticide Storage Area

LOCATION: Langley AFB

DATE OF OPERATION OR OCCURRENCE: --

OWNER/OPERATOR: Langley AFB

COMMENTS/DESCRIPTION: Suspect small pesticide spills

SITE RATED BY: G. McIntyre

I. RECEPTORS

	Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A.	Population within 1,000 feet of site	1	4	4	12
B.	Distance to nearest well	0	10	0	30
C.	Land use/zoning within 1 mile radius	3	3	9	9
D.	Distance to reservation boundary	3	6	18	18
E.	Critical environments within 1 mile radius of site	2	10	20	30
F.	Water quality of nearest surface-water body	2	6	12	18
G.	Ground-water use of uppermost aquifer	0	9	0	27
H.	Population served by surface-water supply within 3 miles downstream of site	0	6	0	18
I.	Population served by ground-water supply within 3 miles of site	0	6	0	18
			Subtotals	63	180

Receptors subscore (100 x factor score subtotal/maximum subtotal) **35**

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) S
2. Confidence level (C = confirmed, S = suspected) S
3. Hazard rating (H = high, M = medium, L = low) H

Factor Subscore A (from 20 to 100 based on factor score matrix) 40

B. Apply persistence factor
Factor Subscore A x Persistence Factor = Subscore B

40 x 1.0 = 40

C. Apply physical state multiplier

Subscore B x Physical State Multiplier = Waste Characteristics Subscore

40 x 1.0 = **40**

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore --

B. Rate the migration potential for three potential pathways: surface-water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface-water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	2	6	12	18
Surface erosion	1	8	8	24
Surface permeability	1	6	6	18
Rainfall intensity	1	8	8	24
		Subtotals	58	108
Subscore (100 x factor score subtotal/maximum score subtotal)				54
2. Flooding	30	1	30	100
	Subscore (100 x factor score/3)			30
3. Ground-water migration				
Depth to ground water	3	8	24	24
Net precipitation	2	6	12	18
Soil permeability	1	8	8	24
Subsurface flows	2	8	16	24
Direct access to ground water	N/A	8	--	--
		Subtotals	60	90
Subscore (100 x factor score subtotal/maximum score subtotal)				67

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above.

Pathways Subscore 67

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	35
Waste Characteristics	40
Pathways	67
Total 142 divided by 3 =	47 Gross Total

B. Apply factor for waste containment from waste management practices

Gross Total Score x Waste Management Practices Factor = Final Score

47 x 1.0 = 47

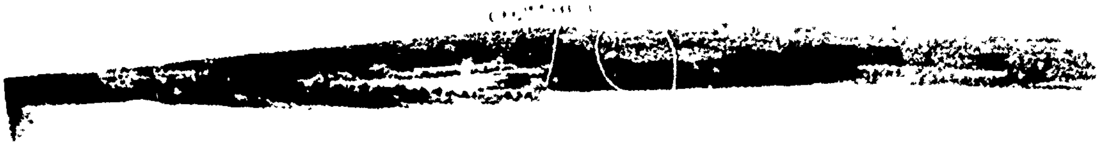

FIGURE A-16. Approximate location of suspected old landfill area (Site No. 1) and old vehicle dumping area (Site No. 15).

FIGURE A-17. Location of old underground fuel lines possible oil saturated area

FIGURE A-16. Approximate location of suspected old landfill area (Site No. 1) and old vehicle dumping area (Site No. 15).

FIGURE A-17. Location of old underground fuel lines possible oil saturated area.

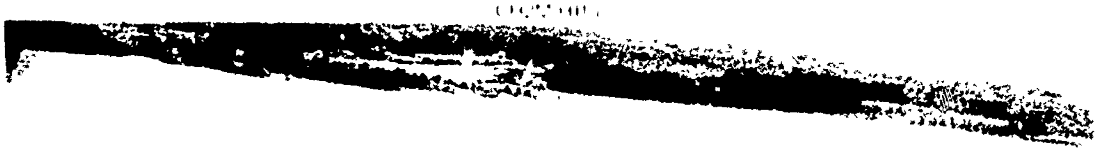

FIGURE A-16. Approximate location of suspected old landfill area (Site No 1) and old vehicle dumping area (Site No. 15).

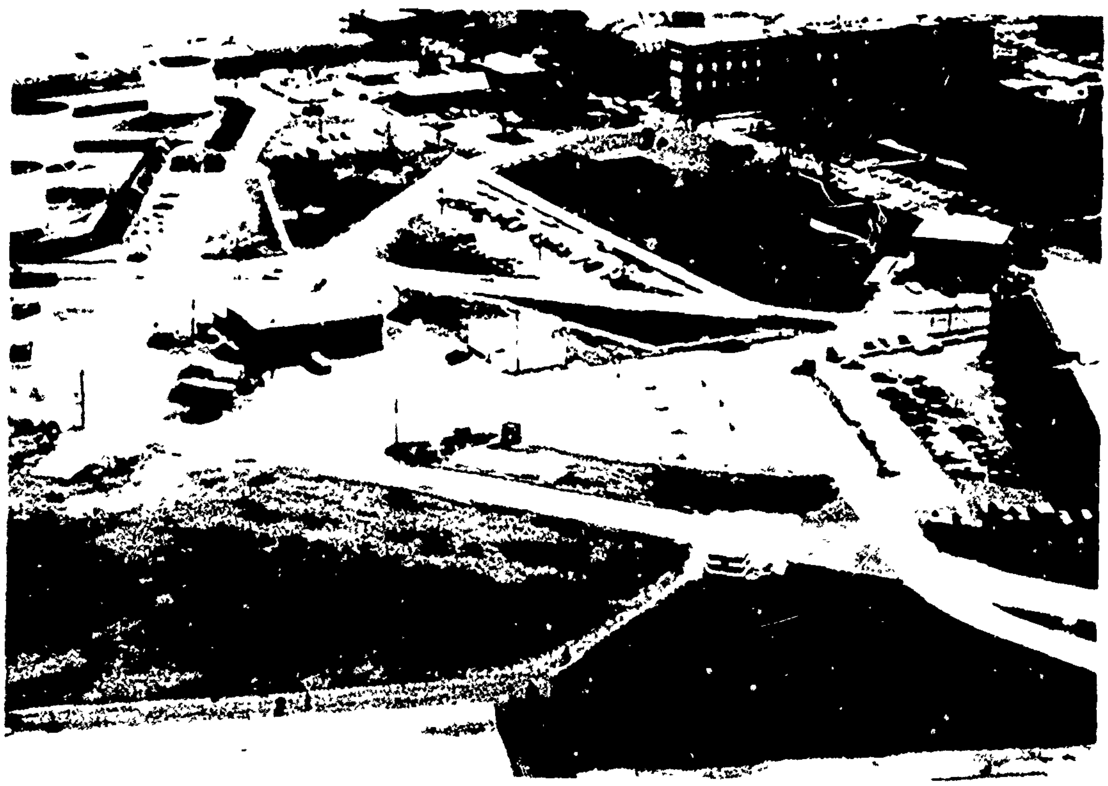

FIGURE A-17. Location of old underground fuel lines possible oil saturated area.